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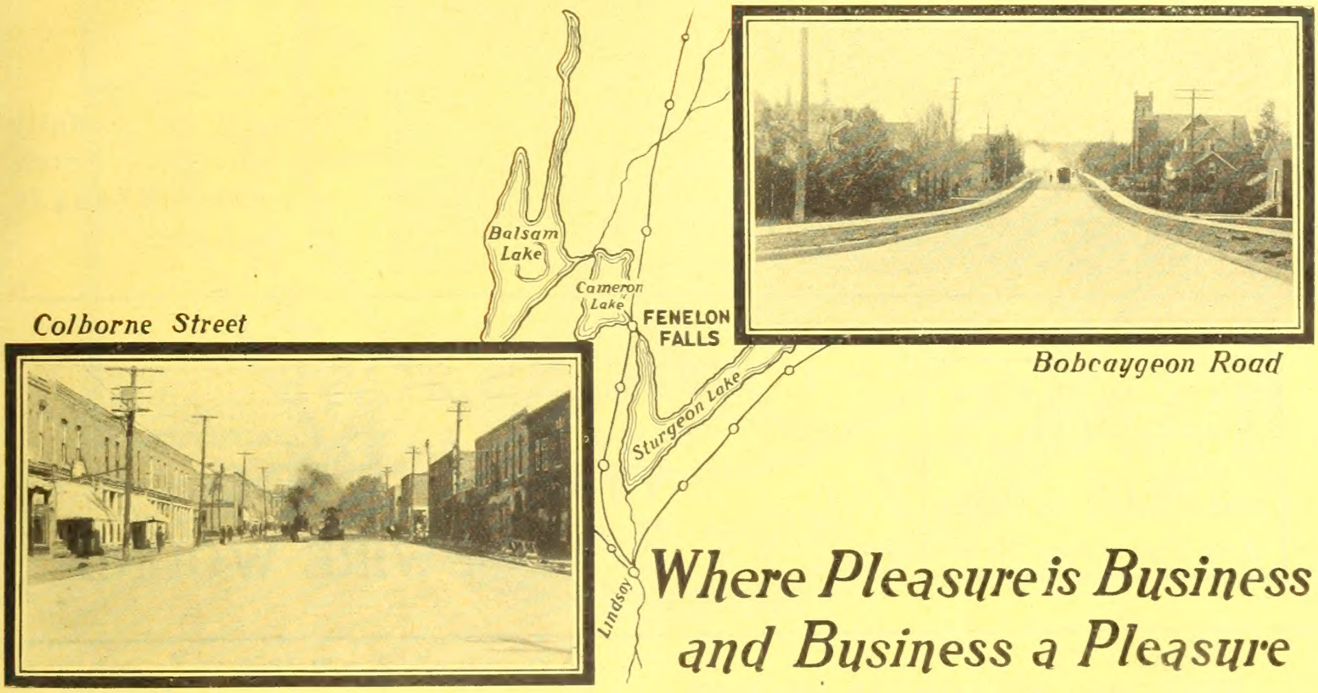
Vol. 37 Toronto, May 2, 1923 No 18

Contract Record and Engineering Review



Where Pleasure is Business and Business a Pleasure

At Fenelon Falls, one of the gateways to that wonderful scenic playground, Kawartha Lakes, where they make a business of catering to the pleasure of their innumerable visitors, the authorities chose to pave their main streets with Asphalt. Permanent road construction of this type not only attracts good business but is good business because of its many good features, foremost among which are its cleanliness, durability, easy maintenance and easy financing.

The work of laying the 18,000 square yards of Asphalt in Fenelon Falls last year was put into the capable hands of the Standard Paving Company, Limited. The type laid was 1½" Asphaltic Concrete over a 1½" Asphalt Binder course on a 6" prepared base. A glance at the illustrations will show the excellent type of work done, and from now on these roads will prove a source of increased profit and pleasure to both townspeople and visitors to Fenelon Falls for many years to come.

Imperial Asphalt was used exclusively in the construction of these roads and we were glad to co-operate with the contractors by insuring in every way possible its prompt and speedy delivery direct from our Montreal East Refinery.

IMPERIAL
Asphalt
PRODUCTS

Paving Asphalts
Asphalt Binders
Liquid Asphalts
Asphalt Cold Patch

ROAD ENGINEERING DEPARTMENT
Toronto **Imperial Oil Limited** Canada

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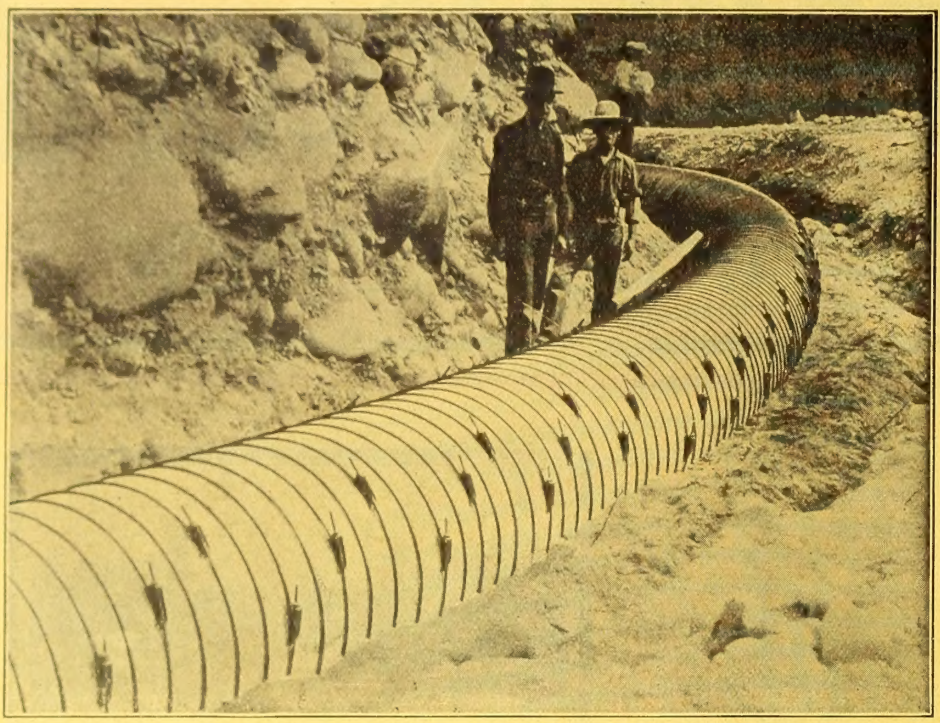


A view of our 36″ Continuous Stave

Wood Pipe

in the famous Capilano Pipe Line which, after serving Vancouver City faithfully for over 15 years, is still in its infancy.

C. S. Pipe

is used successfully for hydro-electric purposes up to 14 ft. in diameter.

TANKS

and SILOS to Order

Any Size—Any Style

CONTINUOUS STAVE

Wood Pipe

or WIRE WOUND

YOU CAN NO LONGER RECKON WITHOUT WOOD PIPE

We have enthusiastic customers willing to assure you that recent improvements have so increased efficiency and durability as to place **Wood Pipe** on a plane with Cast Iron. These features at a low initial cost, combined with ease of transportation and installation, spell true **Economy.**

When writing for information and prices please specify diameter and pressure

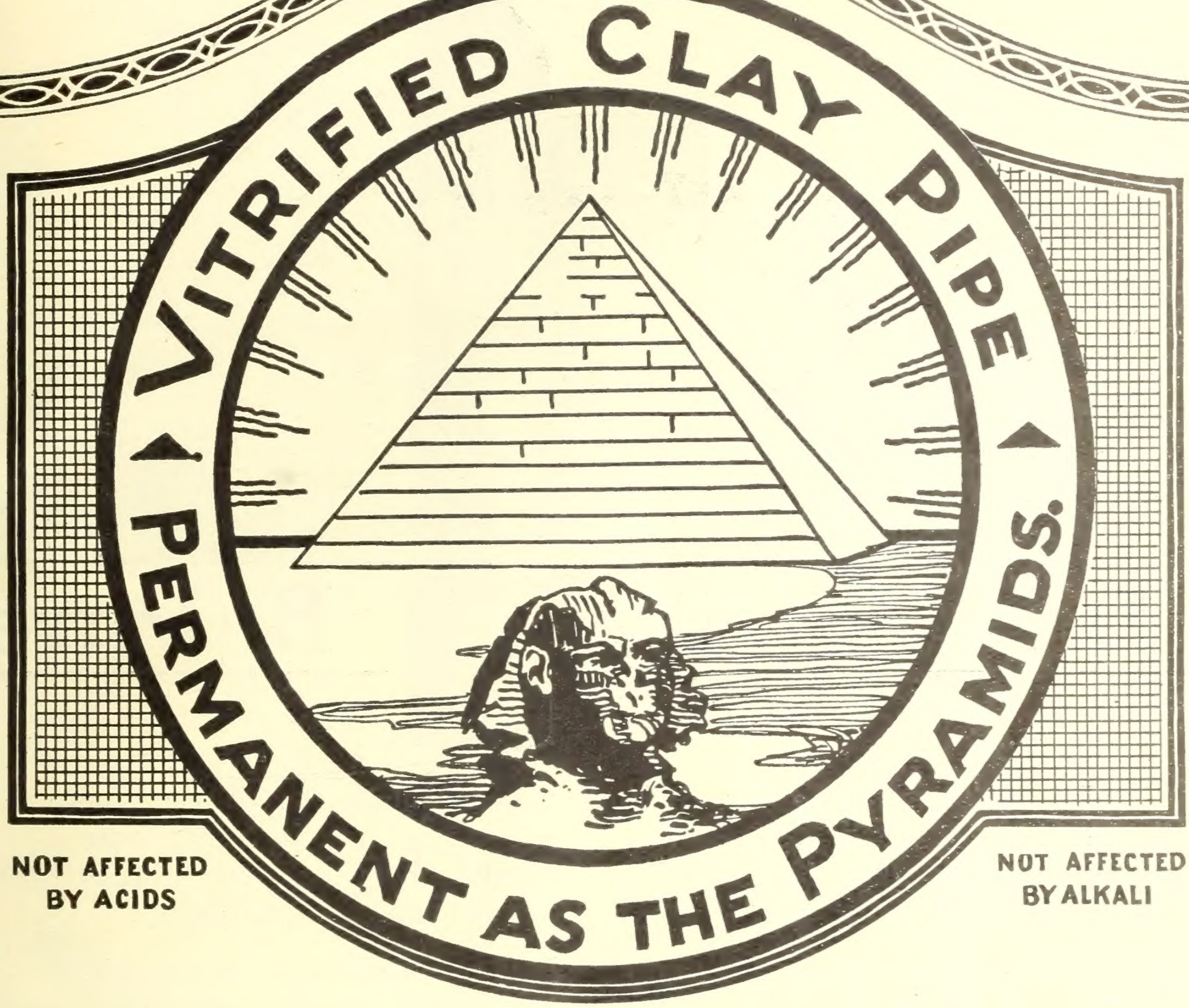
Our Electric-Butt-Welded
STEEL
DOUBLE COUPLING
with Inside Ring
Galvanized

has entirely eliminated joint leaks and has perfected

WIRE WOUND PIPE

Canadian Pipe Company, Ltd.

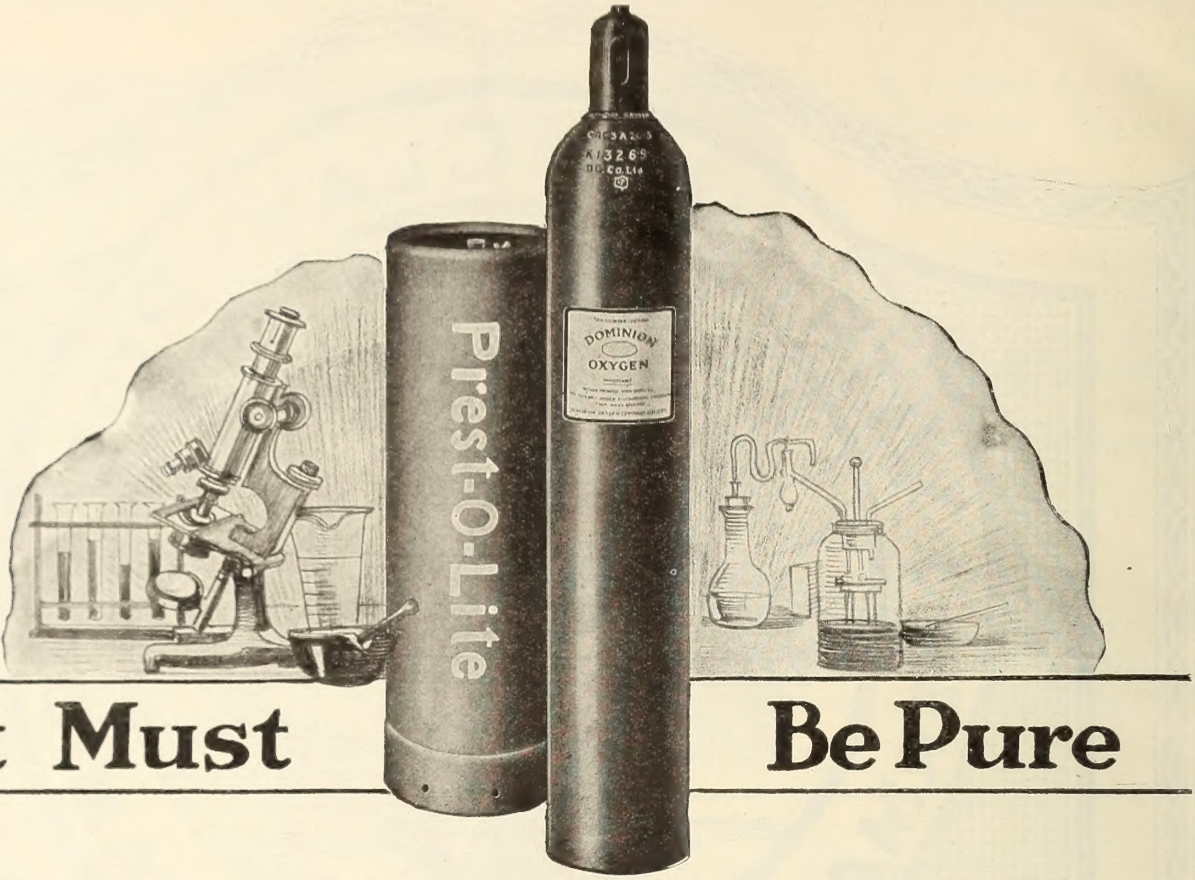
550 Pacific St., VANCOUVER, B. C.



The largest cities in the world construct their sewer systems of Vitrified Clay Pipe. Those that have tested substitute materials most extensively have returned to the use of Vitrified Clay Pipe exclusively because it is the most permanent and therefore the most economical material.

Vitrified Clay Pipe
Publicity Bureau

Toronto, Ontario. St. Johns, P.Q. New Glasgow, N.S.



It Must Be Pure

The purity of the oxygen and dissolved acetylene used in welding and cutting operations has an important bearing on the result.

Only gases of extreme high purity will do a clean, satisfactory job, economically. That is why tests made by chemists and engineers show that both Dominion Oxygen and Prest-O-Lite Dissolved Acetylene have the highest rating of purity.

Both of these products are invariably maintained at a higher mark of purity than is usual for commercial use — an elaborate series of tests in our plants assures this uniform quality.

It is certainly more economical for you to buy the purest products when the price you pay is the lowest obtainable compared with other commercial oxygen and dissolved acetylene price lists.

So why not take full advantage of the saving offered to you by Dominion Service?

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OXYGEN

DOMINION OXYGEN COMPANY LIMITED.

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80 Adelaide St. East, Toronto.

Distribution Points: Hamilton, Merritton, Montreal, Oshawa, Quebec, Shawinigan Falls, Toronto, Welland, Windsor, and Winnipeg.

Prest-O-Lite
DISSOLVED ACETYLENE

Operating the Welding and Cutting Gas Division of

Prest-O-Lite Company of Canada, Limited

The Latest One

EVERY up-to-the-minute contractor knows the Thew. And by the same token he's on the alert to know about the latest improvements in design and construction. That's the reason we have recently been broadcasting a new series of folders—to post you on the details of the latest Thew.

You will want this series (4 interesting folders) in your file. Not because they are works of art, nor because they are gems of literature, but because they will tell you facts you want to know.

These facts concern the features that have made the Thew the greatest result getter. They are told in plain, straight forward language without exaggeration. They are well illustrated and explain why the Thew is so far in advance of the ordinary shovel.

The last of the series goes out this month. If you do not receive your copy mention number 423 when you write.

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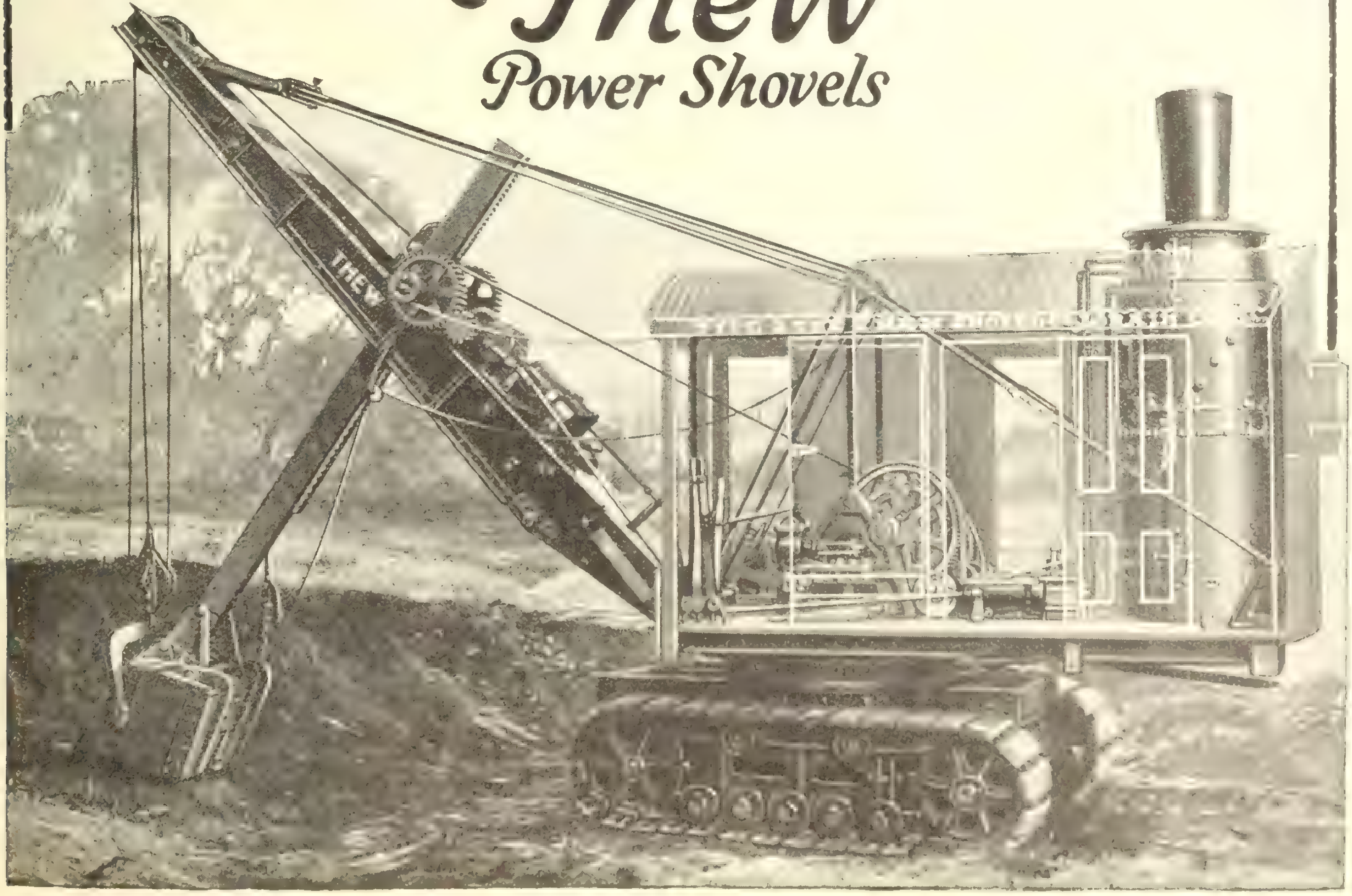
Wilson Equipment Company, Toronto, Canada and
Gormans' Limited, Edmonton, Calgary and Vancouver, Canada

Thew
Power Shovels



CLASSIFIED INDEX TO ADVERTISEMENTS

The following regulations apply to all advertisers:—Eighth page, every issue, three headings; quarter page, six headings; half page, twelve headings; full page, twenty-four headings

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Air Washers
Sturtevant, B. F. & Co.

[illegible] Supplies
[illegible] Limited

[illegible]
H. Mueller Mfg. Co., Limited
[illegible] Regd.

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Northern Architectural Iron Works
Canada Wire & Iron Goods Co.
McGregor & McIntyre

Ash Hoists
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Imperial Oil Company, Ltd.

Beam Spans
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Sarnia Bridge Company

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Shunk Mfg. Co.

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Mussens Limited

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Leckie Co., John

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Mussens Limited
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Spielman Agencies Regd.

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Vitrified Clay Pipe Publicity Bureau

Conduits (Wooden Pressure Creosoted
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Mussens Limited

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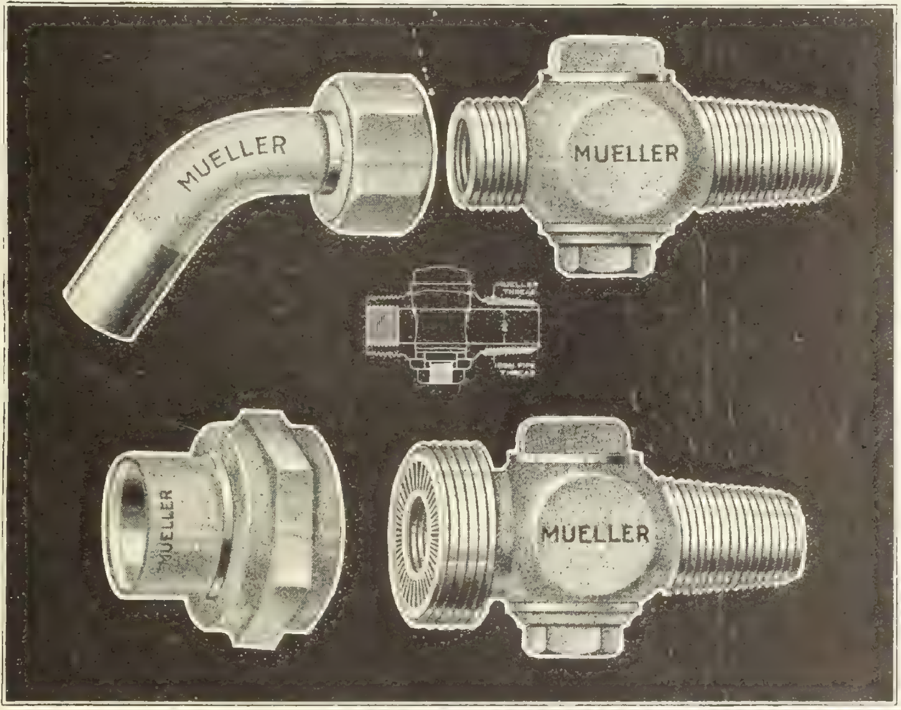
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Electric Fans
Sturtevant, B. F. & Co.

Electric Water Systems
H. Mueller Mfg. Co., Limited

(Continued on page 8)



The Importance of the *MUELLER* Thread On All Corporation Cocks

No single simple device is more important in the Water Works industry today than the famous *MUELLER* Thread—because it materially increases efficiency by providing a sufficient margin of safety where the corporation cock enters the main.

Mueller Corporation Cocks A-201 and A-202

are illustrated above, together with a sectional view of the famous *MUELLER* Thread, which demonstrates that this simple device increases the strength of these cocks over 100% at point of insertion in main. The obsolete iron pipe thread has a taper of only ¾ in. per foot—while the famous *MUELLER* Thread has a taper of 1¾ in., insuring a perfect joint.

You can always get the *MUELLER* Thread by specifying it on your requisitions. For double safety, specify *MUELLER* Corporation Cocks with *MUELLER* Thread.

Detailed descriptions and prices on request. Mail orders given prompt attention.

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Water, Plumbing and Gas Brass Goods and Tools.

American Factory at Decatur, Ill., U. S. A. Branches, New York and San Francisco

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CLASSIFIED INDEX TO ADVERTISEMENTS—Continued

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Elevators
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[illegible]

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[illegible] Enamelled Brick &
Tile Company

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Inglis Co., John
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Sturtevant, B. F. & Co.

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Bureau

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Hamilton Bridge Works Co.

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Canadian Blower & Forge Co.
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Muldoon, Ltd., J.

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Fate-Root-Heath Co.
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Dominion Concrete Company
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Luxfer Prism Co.

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Canadian Mead-Morrison Co.
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Fuller & Johnson Mfg. Co.
General Products Co.
Goldie & McCulloch Co.
Hepburn, Ltd., John T.
H. Mueller Mfg. Co., Limited
Hopkins & Co., Ltd., F. H.
Inglis Co., John
Koehring Co., of Canada
London Concrete Machry. Co.
McDougall Co., Ltd.
Mussens Limited
Waterous Engine Works Co.

Quarry Machinery
Hopkins & Co., Ltd., F. H.
McGovern, T. J.
Mussens Limited

Radiators (Steam Taps)
Canadian Johns-Manville Co.

Rails
Gartshore, John J.
Hopkins & Co., Ltd., F. H.
Mussens Limited

(Continued on page 10)

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Architects: Wm. Steele & Son, Ltd., Toronto.
Contractors: Anglin Norcross Co., Montreal and Toronto.

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and save money by using our Steel Forms

Write, Wire or Phone
H. A. J. ALDINGTON,
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TORONTO
Phone Main 2310

DESLAURIERS METAL PRODUCTS COMPANY
Warehouse: Windsor, Ontario

A Jenkins Standard Gate Valve for use with Indicator Post

Here we show you a Type "K" Iron Body Standard Gate Valve. Bronze Mounted. Inside Screw. Non-rising Spindle. Hub Ends. A valve approved by the Fire Underwriters and like all genuine Jenkins Valves bearing the Jenkins Diamond Mark.

This valve and Jenkins Indicator Posts are fully described in Catalog No. 9 which shows the complete Jenkins line. Free on request.

JENKINS BROS. LIMITED
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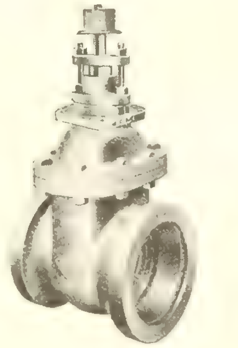

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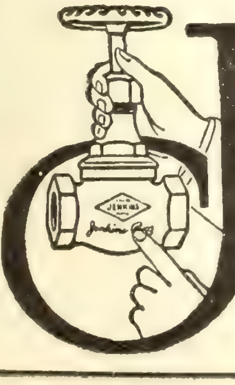

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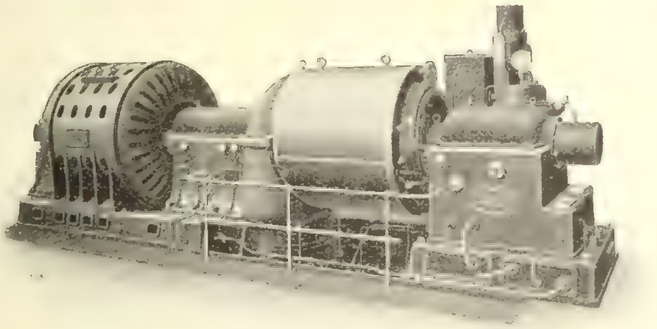

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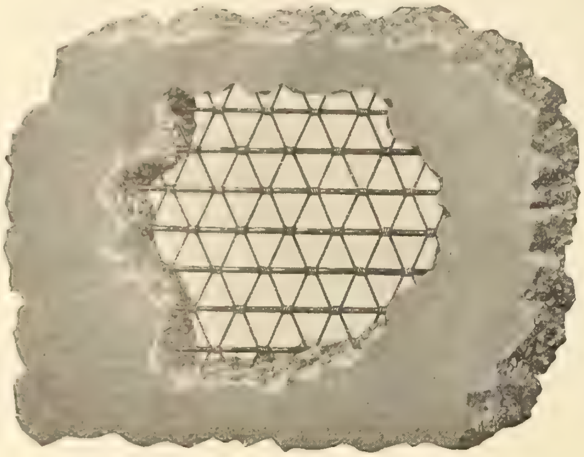

Impact, frost action and imperfect subgrade are not so dangerous to a concrete road that is reinforced with Triangle Wire Mesh, because this fabric instantly distributes the stresses in six directions over a large area. A thinner slab, reinforced with triangle Wire Mesh, will give better service.

One fundamental reason for reinforcing concrete roads is to prevent contraction cracks. Concrete is strong in compression, but weak in tension. Steel fabric reinforcement adds tensile strength. It more than pays for itself in the prevention of shrinkage cracks alone, and its value is again demonstrated whenever a sudden cool thundershower floods a pavement that has been baking under the summer sun.

The forces involved in shrinkage and contraction are much too great to be controlled by any haphazard placing of reinforcing steel. The problem is not merely one of getting so many pounds of steel into every 100 sq. ft. of pavement; the reinforcement must be scientifically designed so as to guard every part of the concrete against cracking.

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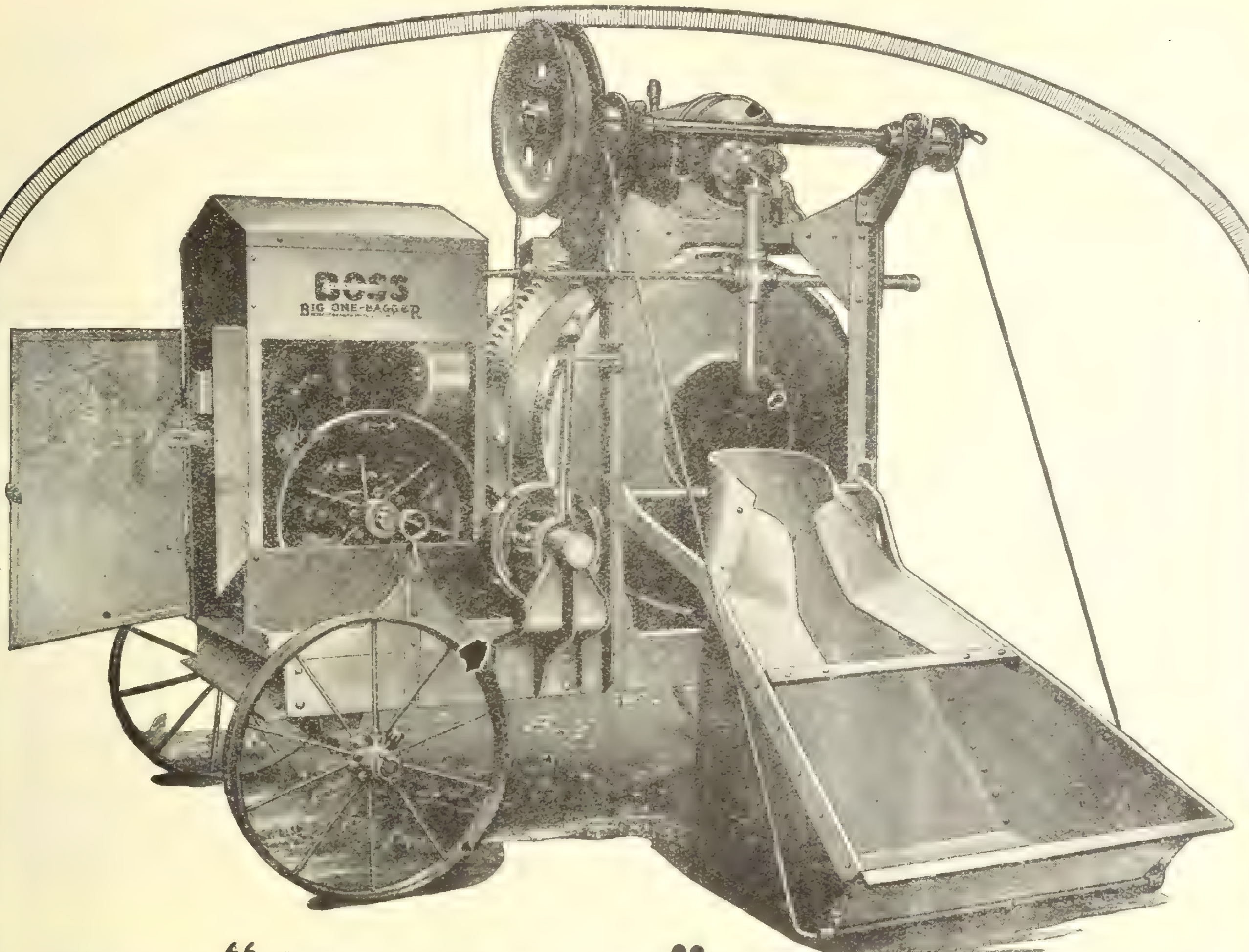

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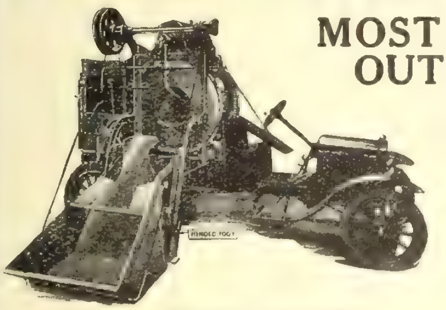

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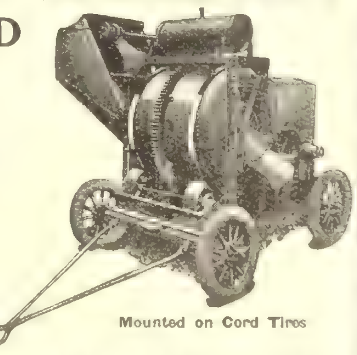

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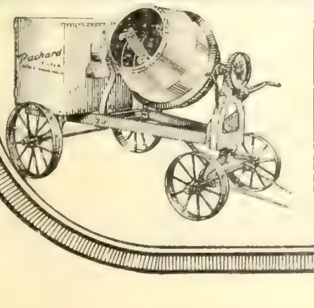

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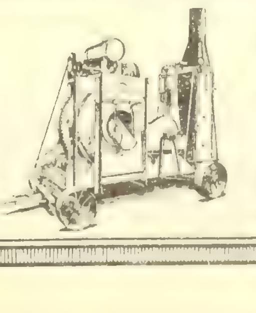

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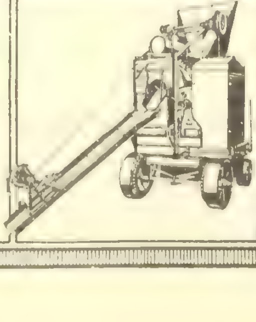

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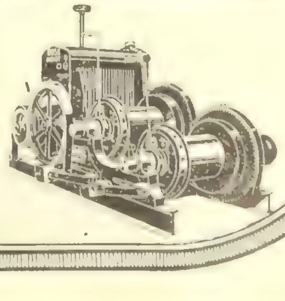

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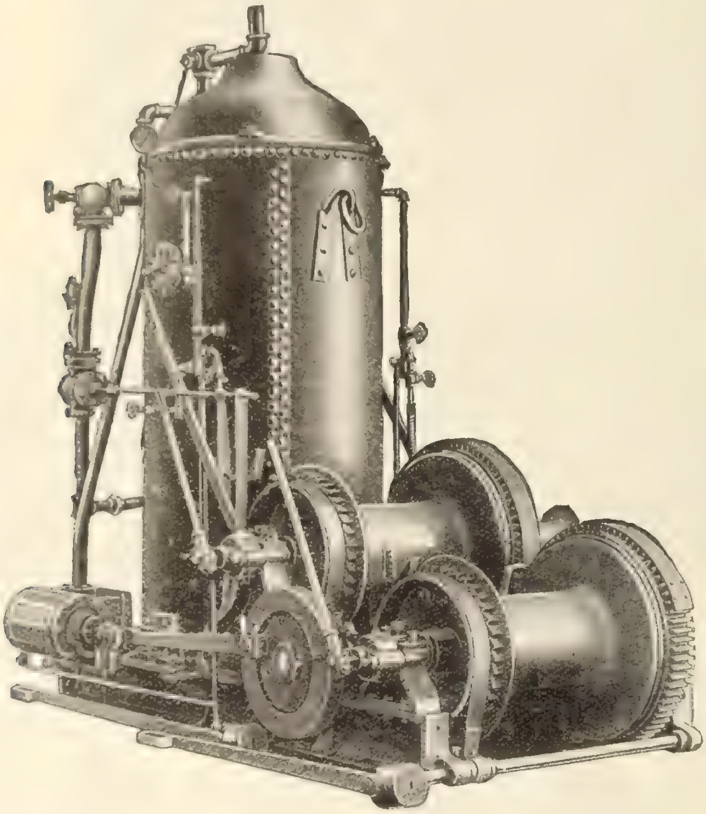

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Outside and inside walls of cinder brick were used as a backing for three coats of Gunite 5/8 to 7/8 of an inch thick, shot on outside, between the walls and inside the building. The insulation is perfect and the loss of cold by the walls less than any other method.

The total length of the building is 300 ft., with a 100 ft. elevation. Four men with each "Cement-Gun" covered a daily average of 2,700 square feet. The "Cement-Guns" were never removed from their first location on the ground floor.

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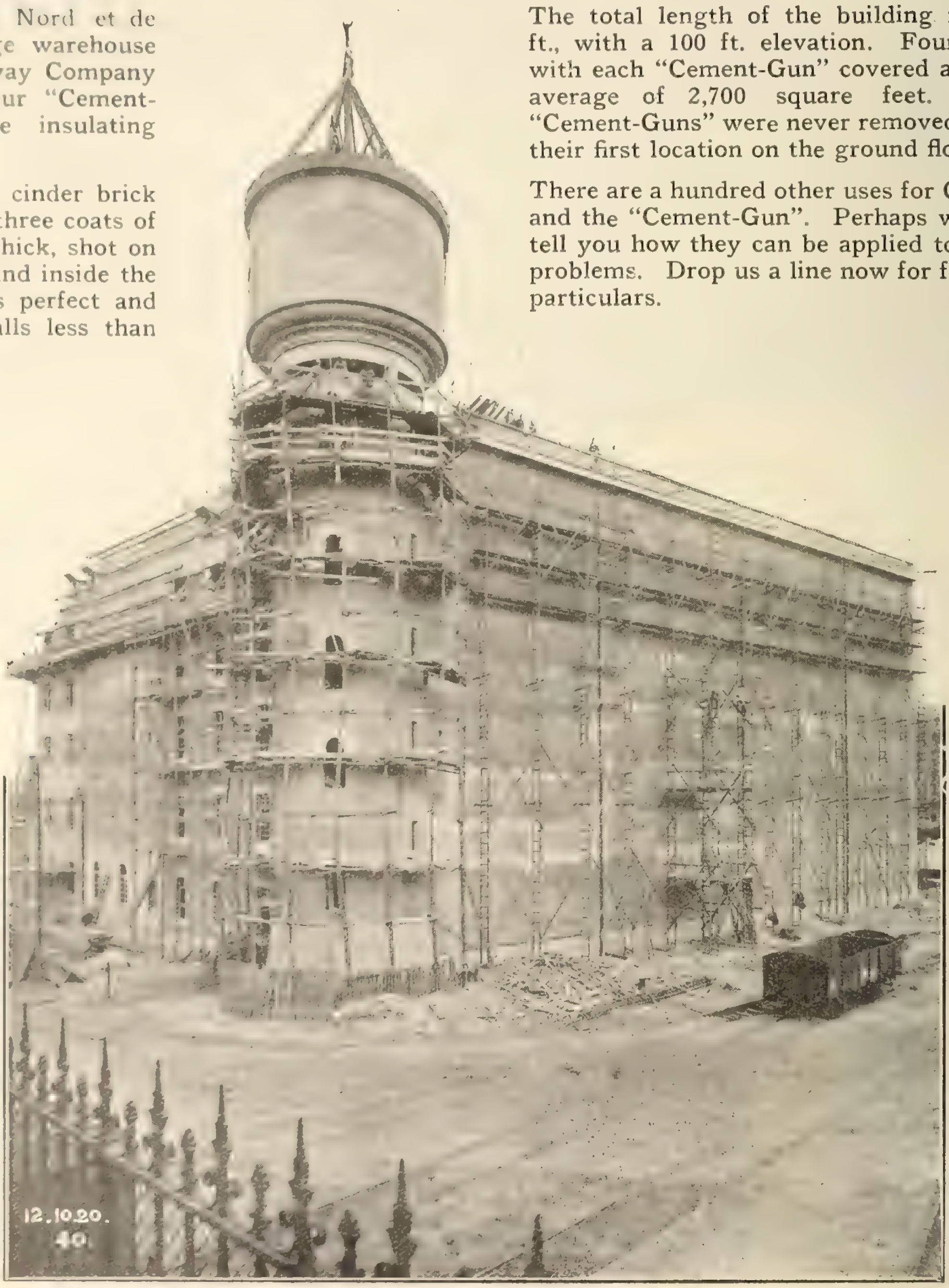

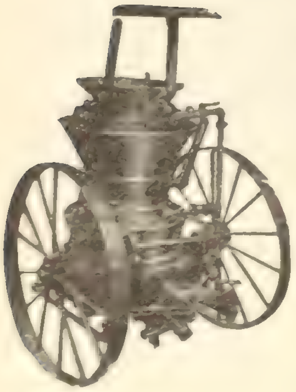

The "Cement-Gun" is not a restricted article. It may be purchased from us and used [illegible]

"Cement-Guns" sold in Canada are manufactured in Canada

PITTSBURGH
[illegible]

Cement-Gun Company, Inc., Allentown, Pa

CHICAGO
SIOUX CITY
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Agents in Eastern Canada: General Supply Company of Canada, 356 Sparks Street, Ottawa. Branches in Montreal, Toronto, Winnipeg, North Bay, Moncton.

Agents for B.C. and Alberta—Cement-Gun Co., Inc. 815 Alaska Bldg., Seattle, Wash.

Foreign Agents: International Cement-Gun Company, Ziest, Holland.

All inquiries except from the United States and its possessions; Canada, Mexico and Cuba, should be taken up with the International Cement Gun Company, Ziest, Holland.

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FOR

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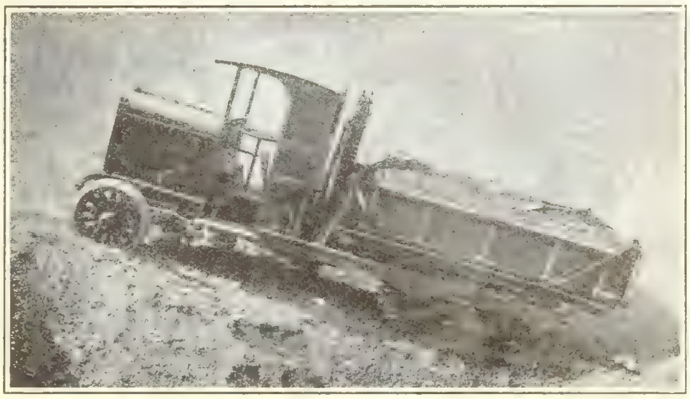

Linn Tractor Takes a Load from the Pit

Linn Tractor Hauling Two 10-ft. Blade Graders on Highway Work

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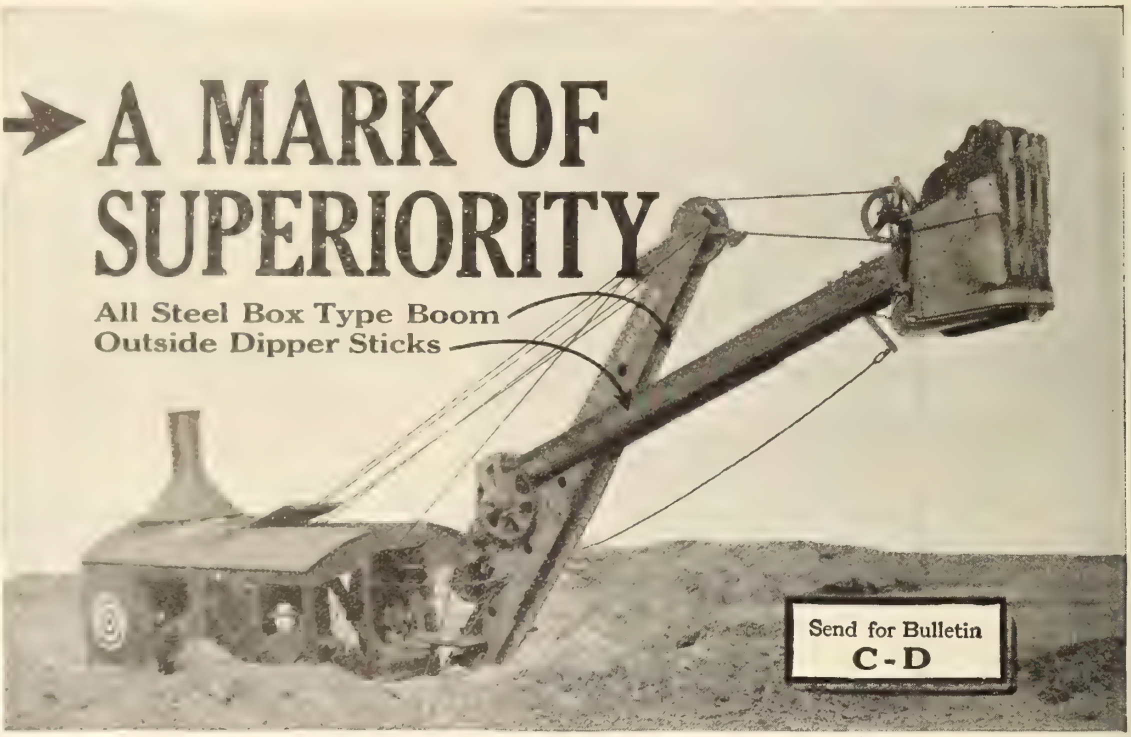

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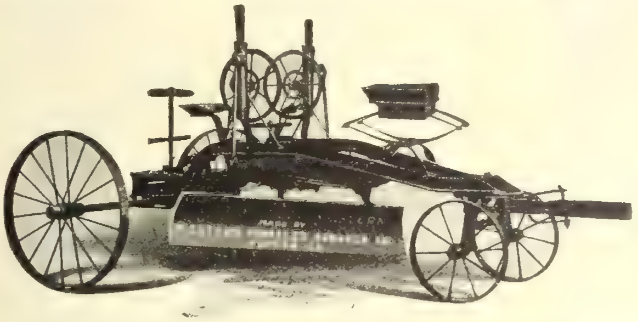

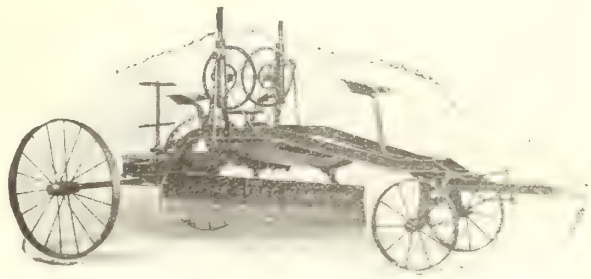

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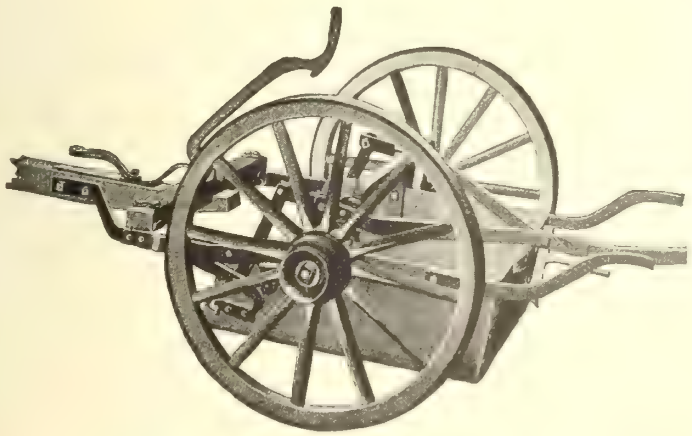

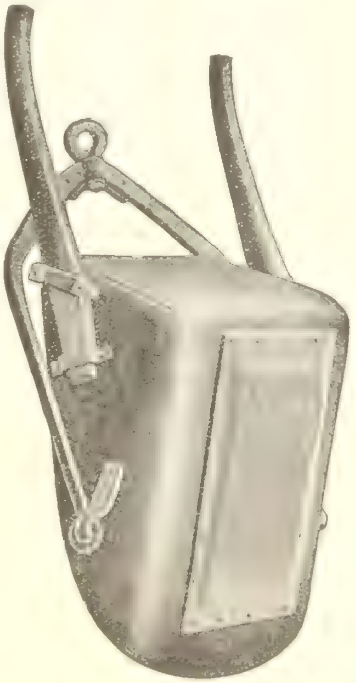

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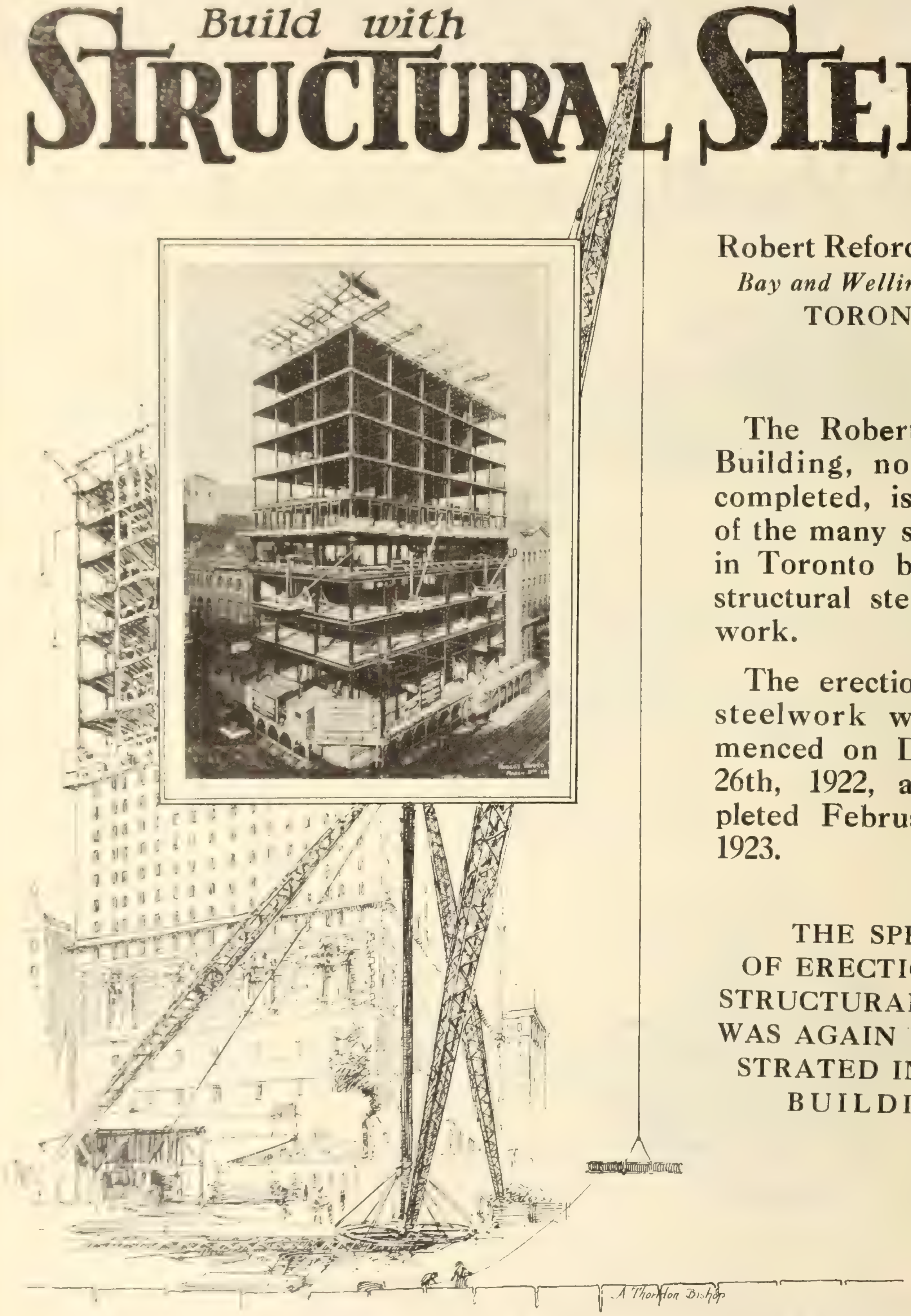

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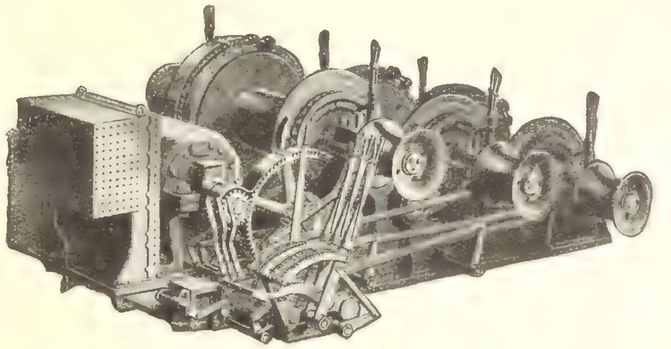

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ERIE Shovel owned by Bent Bros., of Los Angeles, Cal., digging a 7-mile trench at Oklahoma City, Okla.

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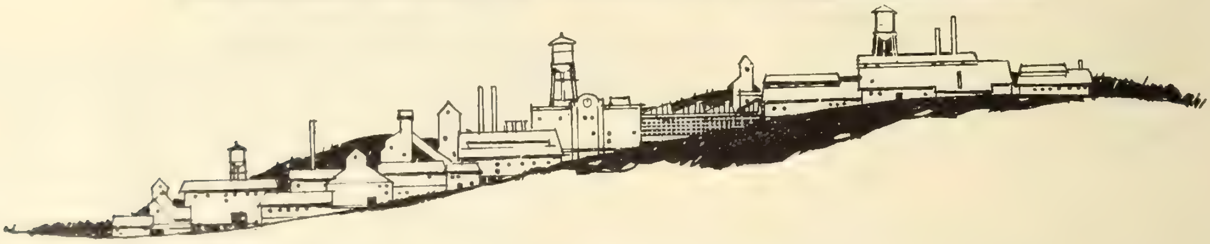

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It is significant to note, however, that these same men are boosting Gyproc Fireproof Wallboard as the solution to the problem.

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Montreal: 374 Beaver Hall Sq.
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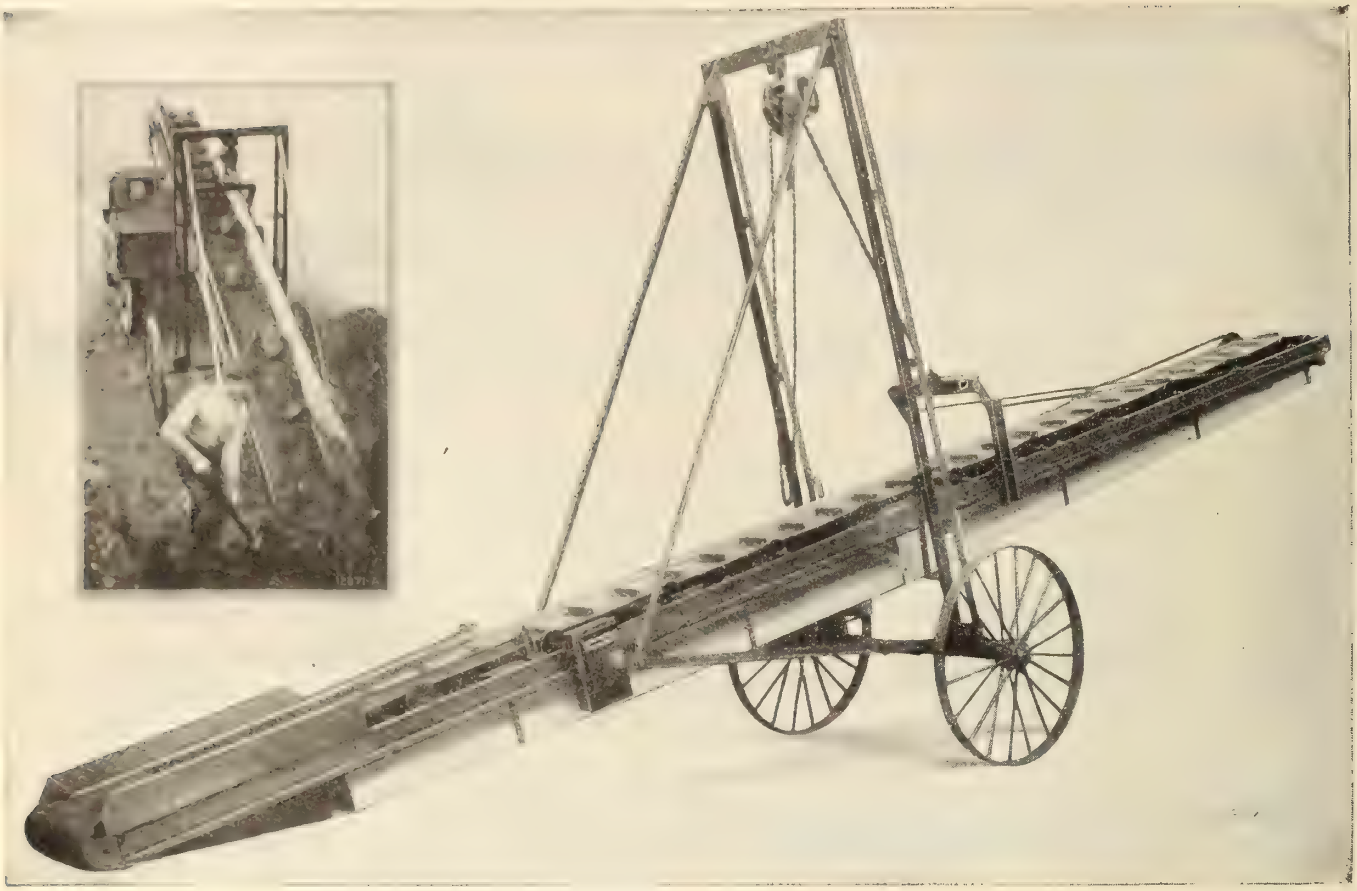
Every day the Gyproc message is being carried to thousands of home owners, builders, contractors and others through the daily newspapers. Fire demonstrations are held throughout the country whenever the opportunity presents itself. Thus the manufacturers are co-operating with the dealer, helping him to get every dollar's worth of business fram the Gyproc agency.



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FEATURES

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- Belt guaranteed against cutting or fraying.
- Wide loading hopper at foot of conveyor is hinged—easily and quickly opened.
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HERE'S a thousand-dollar Link-Belt Portable Belt Conveyor at our new low price—$790.00. It is one of our standard types, built to the high Link-Belt standard. It is guaranteed.

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☐ Send us the Link-Belt Portable Loader Book No. 550, showing the complete Link-Belt line of Portable Loaders.

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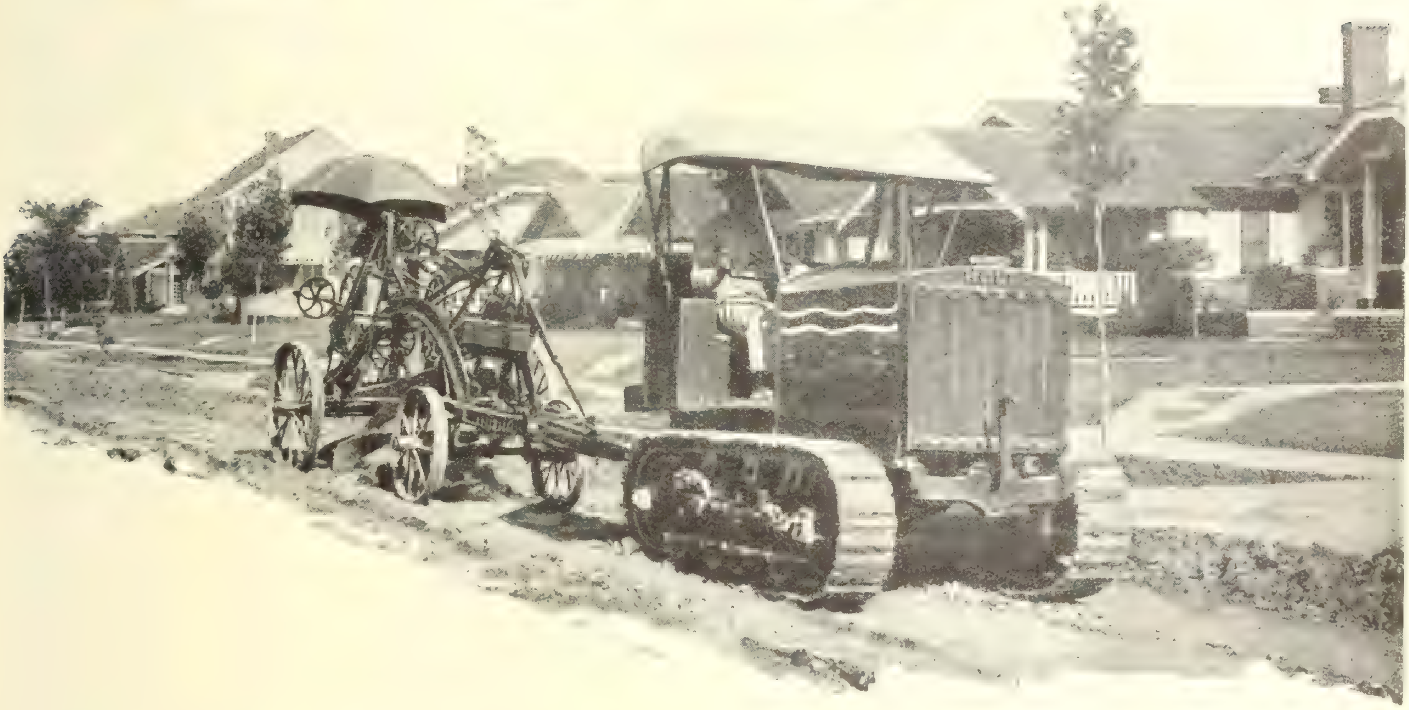

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The "Caterpillar's" field of usefulness is by no means limited to road work. There is a "Caterpillar"* of size and capacity for every power need. On farm or ranch, in the mining, oil and lumber industries, for snow removal and other civic work—wherever tractive power and endurance are at a premium, the "Caterpillar" has no real Competitor.*

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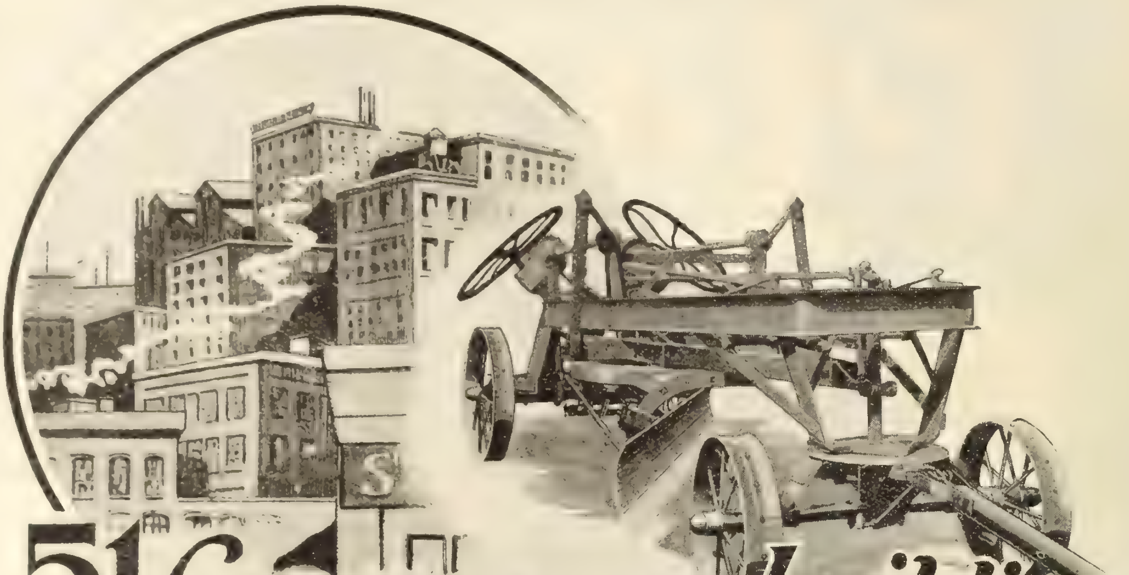

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YOUR Stockland dealer knows that Stockland design, materials and construction will give you fullest satisfaction—and make you a warmer friend of his.

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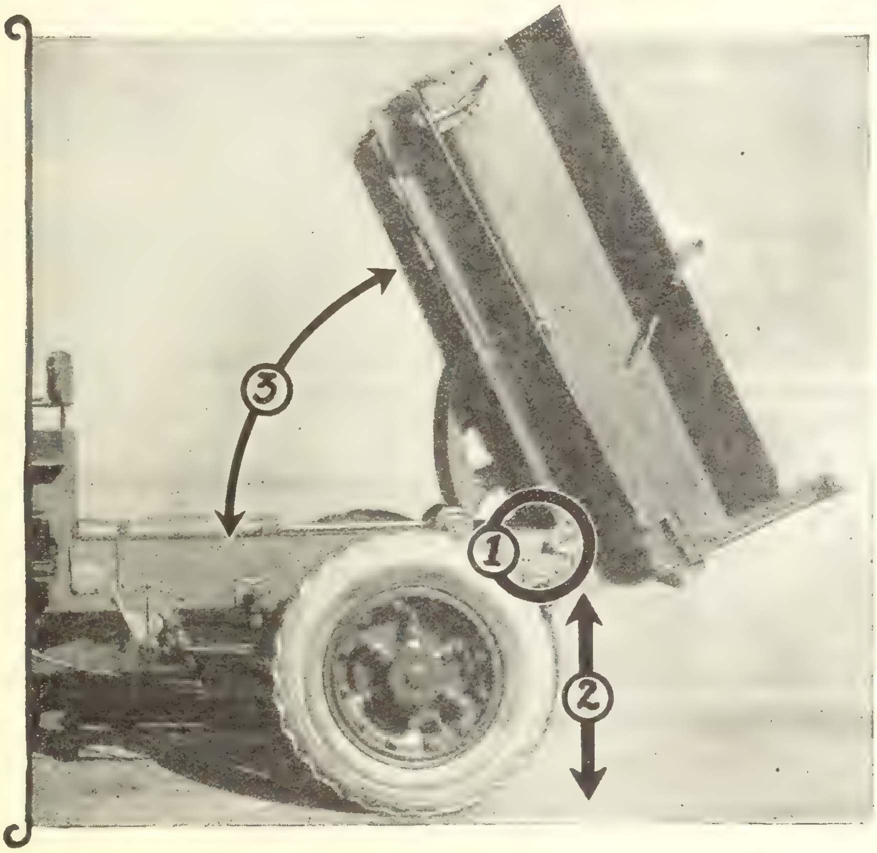

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WHY? Because they are made by people who are the PIONEER ORNAMENTAL FIREPROOF DOOR BUILDERS IN CANADA, people whose goods have proven themselves not only in everyday work but in hot fires. We have recommendations from customers as far back as 1908 telling about our Kalameined Doors saving their buildings from flames and water damage.

Our doors may cost you more than some, but they are worth the difference. Our reputation is back of each door and we positively assure you of the best of workmanship, of materials and of good service.

Our equipment is complete in every detail to turn you out a real finished article. Let us hear from you when you are in the market and you will get an interesting quotation.

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A National Journal for the Construction Interests of Canada, reaching Architects, Engineers, Contractors Municipal Officials, etc.

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How Can the Speculative Builder be Eliminated?

The boom in house-building during the past many months has brought the jerry builder into strong competition with the legitimate contractor; in fact, in too many instances the latter has been eliminated from competition entirely. While it is impossible to estimate even approximately, there is every reason to suppose that a very considerable proportion of the new houses erected in the past two or three years of residential activity, have been built by speculative builders, by real estate agents or by the private owner with the help of a carpenter—"men," as Mr. J. B. Carswell recently stated, "who although quite responsible in their own regular business, are equally irresponsible in the construction business; men who know nothing and care less for the larger problems which confront the industry; men who are in it today and gone to-morrow, in it for their own very personal interest just as a man goes into the stock exchange and has his little speculation and gets out again."

Any home owner who has come into the market in the last few years knows what this has led to—houses which while veneered with lots of paint to look like homes, are built of poor quality material put together in a slip-shod manner and then sold to the unsuspecting purchaser at exhorbitant prices. To their sorrow hundreds of home-owners know how they have been fooled. They have seen the fruits of sloppy workmanship and faulty materials in the settling of walls, the dropping of plaster, the gaping of joints in wood trim, the curling of floors, the inadequacy of the heating or a dozen other deficiencies that follow in the wake of speculative building.

The fly-by-night builder in some form or other will always be with us because there will always be people who measures the value of buildings only by price. Such people, it may be said, deserve the experiences which a few months' ownership will disclose. Something more substantial, however, is expected by the average home purchaser—Something that will be value for his money. He should not expect to be "done" by a fly-by-night on whom he has no hold and from whom he can get no redress.

The honest builder seeks to serve his client, to give him fair value for the money expended, to produce a building that will give long years of service and not eat up its cost in early and continuous maintenance. Of such builders, fortunately there are many, but temporarily, at least, they have become outnumbered by irresponsible contractors whose activities have been encouraged by the dire need for housing. To curb them is a big problem that every legitimate contractor should turn his mind to, for they are taking business off the hands of the responsible contracting profession and, by failing to render service to the ultimate purchaser, are investigating legitimate contractors with a cloak of suspicion and distrust. It should, therefore, behoove every true builder to make an effort to restrict the activities of his jerry-competitor. Perhaps this can best be done by an attempt to educate the public to the desirability of seeking competent contracting advice regarding the building of homes. Group advertising would suggest itself in this connection, but whatever the scheme, the essential fact is that the public— the prospective home purchasers—should be apprised of the fact that they can spend their money with good effect and receive a dollar's worth of value for every dollar expended. They should be acquainted with the wiles and schemes of the irresponsible builder. This is an obligation that rests with those in the industry who are honestly upholding the ideals of service. To them falls the duty of giving answer to today's most frequent plaint, "Oh where may an honest builder be found?"

C.E.A. Convention, June 21-23

The Canadian Electrical Association are holding their annual convention at the Mount Royal Hotel, Montreal, on June 21 to 23 inclusive. The programme promises to be a very attractive one.

The Engineer's Relation to Public Health

An Abstract of an Address Delivered by M. N. Baker before the John Hopkins University School of Hygiene and Public Health

Among all the engineering works that have contributed to the reduction of sickness and death and the accompanying suffering and heartbreaks probably none equals public water supplies—at least not on the North American continent. Probably sewerage systems come next, but if so then it is the quick removal of human excreta from our houses and yards and streets rather than its final disposal that deserves the credit. Plumbing, except as means for distributing water to points of use and removing it after it has been soiled, seems to have but a minor relation to health. Garbage collection is more a branch of municipal cleansing or housekeeping than of health, except where garbage uncollected attracts flies that have access to privies or rats that may spread plague. The final disposal of garbage is still less a health matter. The character of paving and of street cleansing, it seems to me, has far more of a bearing upon public health than has garbage collection or disposal. Where mosquitoes and malaria or yellow fever prevail, engineering works in the nature of land drainage are generally the best and cheapest means of control.

Engineers for House Planning

House and building design and construction, with particular reference to air, warmth and light, dryness, the saving of labor for housewives, and general convenience play their part in public health. Heretofore, these things have been regarded as the function of the architect, but for years now we have had heating and ventilating engineers, while in various ways the engineer is becoming more and more concerned with construction of houses and other buildings. From the engineer we may expect a reduction in the cost of housing that can come only from saving labor and material through systemization, quantity production and other engineering methods. With a reduction in the cost of shelter may be expected a relief from overcrowding and other evils that undermine health and spread disease.

I believe it is to city planning and its results that we must look for much of the future improvement in public health and particularly reduction in the general death rate in so far as these depend upon engineering work; a reduction traceable not so much to any one readily specified measure as to improvement in many inter-related causes that go to make up community convenience, comfort and mental and physical health.

More Knowledge Needed

With a general city death rate at or near 10 per 100,000, with a typhoid death rate down to 5, 3 and even 2 or less per 100,000; with infant mortality in progressive communities well below 100 and running on down to 50 or less under well-controlled conditions; and with other elements tending to change what has been called the health yardstick to a foot rule scale, the public health official, and particularly the engineer, needs more knowledge than now exists of what has caused these marvelous declines in mortality and morbidity rates in the past and, of greater importance, what further declines he may expect and by what means he may accomplish them.

I say this knowledge is needed by the engineer in particular because, as I have already stated, it is his habit and peculiarly his function to measure the worthwhileness of proposed works and services in terms of costs and of results. Is the game worth the candle? Can the desired end be better and less expensively achieved by some other means? Would the same amount of money spent for some other purpose save more lives or bring more health?

For many years past the engineer measured the results of his efforts in the sanitary field by the typhoid death rate. At least this was true as regards water supply, the improvement of which in the past is believed to have been the most potent engineering factor in reducing the typhoid and the general death rate.

At the present moment the water-supply engineer is often in a quandry as to how much additional expenditure he is warranted in recommending for one supply instead of another on the possible chance that a few thousand or hundred thousand or millions of dollars—according to the size of the city—thus spent will provide water that will lessen by a shade a typhoid rate almost at the vanishing point or perchance in some way which no one can clearly and positively define reduce some other human ill. The engineer, the health officer, the city councilman and the taxpayer, each and all, need a more delicate and certain index than is available, now typhoid has been reduced to so low a figure, of the causes of the past decline in typhoid and the probable cause of future decline. Have the engineer and the health officer come to the bottom of the curve so far as efforts against typhoid in many of our cities are concerned? Can the experts hereafter merely hold what they have already gained? If further reduction may be expected, and typhoid wholly eliminated, then by what means? Would the same, or perchance much less expenditure, capital and operating, reduce by two or by five per hundred thousand the death rate from some of the causes other than typhoid as against a half or a tenth on the typhoid scale?

Before these questions can be answered we need an intensive-extensive study of the causes of typhoid fever; a study into account, chronologically, the volume and the efficiency of the several lines of work that have combined to reduce typhoid fever—such as water-supply protection, filtration and chlorination; milk ordinances, inspection and pasteurization; contact control in its many phases; better medical and nursing care; anti-tpyhoid inoculation. The same kind of study is needed of other causes of death and related or possibly related public-health work.

Building Exposition

A large exposition of building ideas is being planned as a feature to the sixteenth annual convention of the National Association of Real Estate Boards, to be held in Cleveland, O., on June 25 to 30. All classes of building material used in the construction of both domestic and commercial buildings will be on display, each exhibit being arranged to have a constructive and educational value. The official floor plan, of Cleveland's new six and a half million dollar public auditorium, where the exposition will be staged, calls for one hundred and forty-four exhibit spaces, with the centre of the arena floor reserved for a feature educational exhibit.

Should High Buildings be Prohibited?

The Proposal to Erect Another Skyscraper in Toronto Has Caused Protests from Those Who are Opposed to the Attempts to Emulate New York City

The recent report that the Canadian National Railways would erect a tall office building at the corner of King and Yonge streets, Toronto, has led to some vigorous protests against the construction of another skyscraper at that corner. As indicative of the arguments that are advanced in favor of restricting the heights of buildings the following letter is typical:

I have noticed with interest several articles recently in the papers to the effect that the C.N.R. intend to build the largest skyscraper in the British Empire at the corner of King and Yonge Streets.

Unfortunately this news will appeal strongly to a number of our citizens, who would like to see Toronto's skyline emulate New York and Chicago, and therefore, see in these reports indications that the C.N.R. is really going to do something for this city.

Apart, however, from its somewhat political value, I can see nothing to favor so tall a building and believe there are two very strong reasons against it.

First: It is not a good financial investment for the railways.

Second: It is economically unsound from the point of view of the city.

In this argument, we cannot go into the aesthetic value of such a building to the city. That depends upon the design and whether all four sides of the building are studied, or whether it is left with two backs as our present highest skyscraper. Here, also is a matter of taste, which varies with the individual.

It will come as a shock to many, that increased height in building, beyond a certain point, does not bring in increased revenue. The reason is, that the higher you go, the more space you have to use for elevators, piers, walls, stairs, etc., and therefore the less rentable area in proportion to the size of the building. Also, beyond a certain height, the construction costs, per cubic foot, start to increase.

A very interesting article appeared in the November 1922 issue of the Journal of the American Institute of Architects, "The Passing of the Sky Scraper," by Mr. George C. Nimmons, a distinguished Chicago architect.

While serving on a committee of the Chicago Real Estate Board to study building heights for the new zoning laws, Mr. Nimmons made a series of calculations, based on his wide experience to establish the earning power of high buildings. He shows that on a lot 160′ by 172′, valued at $1,500,000, the efficient height (that is the height at which a building will give the greatest return) is between 15 and 20 stories, probably about 18.

In an article in the same periodical, January, 1923, Mr. Edwin S. Jewell contends that Mr. Nimmons has set the efficient height too high and has not considered that buildings depreciate and land values increase as time goes on. He concludes: "I am in full accord with Mr. Nimmon's contention that the skyscraper is passing, and should pass. I have been managing office buildings for years and know from experience and observation that on any lot in any American city a low building will pay larger income and greater profit on the investment in the long run than a tall building. It is not only better for the investor, but better for the city to have office space spread over more land."

In this particular case in Toronto, the value of the land is considerably greater per square foot than is Mr. Nimmon's example, but the lot, however, is so small that the low percentage of rentable area would, in my opinion, offset the high value of the land as an argument for height. It must also be remembered that the land increases in value as it approaches the corner—so that if more land were added the rate per square foot would decrease as the size of the property increased.

Before it became generally suspected that buildings were going far beyond the efficient height, it was clear to many that skyscrapers were not an asset to the community as a whole. A number of the commissions have been formed in the largest cities in the States, to enquire into the limiting of the heights of buildings. The most important charges proven against the skyscraper from the standpoint of the community were:

1. Increased congestion of traffic, causing expensive control and loss of time to citizens.
2. Increased danger in case of fire or panic.
3. Increased sickness, such as colds, pneumonia, etc., due to lack of ventilation and sunlight.
4. Inflation of land values beyond what is stable and reasonable.

To suddenly restrict the heights of buildings where land values have conformed to a condition with the sky as the limit is obviously unsound and would undoubtedly cause a panic hence the now famous New York laws which require setbacks at certain heights to allow light and air.

In Toronto, fortunately, we have not yet gone so far that we cannot enforce a reasonable restriction without damaging land values. The present by-law limits the height of a fireproof building to twice the width of the street which is none too low. Nevertheless, whenever a prospective building owner has appeared before the council and announced that he must go 20 stories to make the building pay, and won't build unless he can, and if he doesn't so many mechanics and laborers, etc., will be out of employment, etc., etc., the tendency of the council is to fall for his arguments, and allow the by-law to be waived.

We must bear in mind that we are not a wealthy country as yet, and cannot afford to waste money on unprofitable (I use the word in the broadest sense) building enterprises purely to make a popular appeal. If we wish beautiful buildings, we must plan them efficiently and rely on simplicity of line, proportion, and color for our effects and not on tawdry adornments and a display of reckless spending.

I do not wish in any way to oppose the erection of a fine new building on this corner, but merely wish to indicate the folly of building too high in a desire that the project should be an asset to the city and the railway both.

F. H. Marani,
Toronto, Ont. Architect.

Essential Points in Sewer Design

Cross Sections that Are Generally Used and the Advantages and Disadvantages Pertaining to Them—Influence of Soil and Other Conditions on Construction

At the annual meeting of the American Concrete Institute the committee on reinforced and plain concrete sewers and conduits brought in a report which proposed specifications for concrete sewers and recommended rules for design. The latter part of the report covers briefly some essential points in design in an interesting manner. In view of the value of the information contained, it is reprinted herewith:

One of the first topics to consider is the cross-section. Many of the masonry sewers are of circular cross-section, though some of the older ones are egg-shaped or oval. In recent years several other forms of section have come into favor. The following discussion describes briefly some of the advantages and disadvantages of the principal types.

Circular Section

The popularity of this form over the others is largely due to the fact that it encloses a given area with the least perimeter, thus according the highest velocity when flowing half-full or full. It also offers economy in masonry, under favorable circumstances, but where the trench bottoms are flat or where piling or timber platforms are necessary this does not hold true, as the arch requires additional support. In combined systems, however, this section is not as advantageous as the egg-shaped, as here the dry weather flow of sewage is small in comparison with the storm-weather flow, and the velocity for the low flow would be less in the circular section. For sewers under 5 ft. in diameter these two sections, the circular and the egg-shaped, are usually preferred to other types.

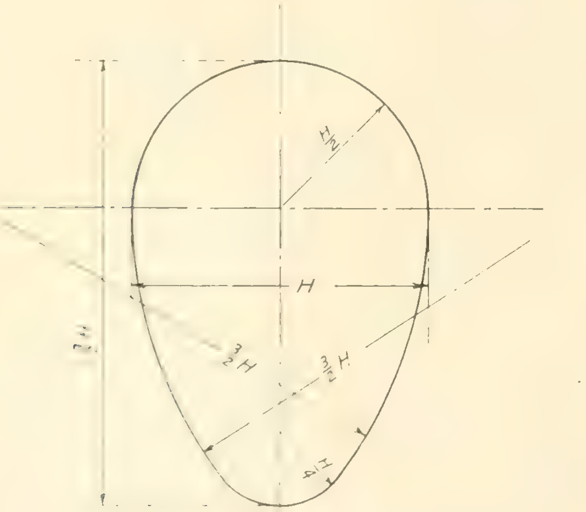

Fig. 1—Phillips' standard egg-shape section

Egg-Shaped

As just mentioned, in the case of combined sewers the egg-shaped section is preferred by some, from the fact that as the depth of flow decreases, the hydraulic radius remains more nearly constant. This advantage also obtains where there is a sanitary sewer to be constructed in a district of which the population served is small in proportion to that anticipated. To express it in another way, with the egg-shaped section for a given quantity of flow, the depth is greater, then the velocity is slightly higher than would be the case with a circular section. This higher velocity also produces better flotation for solid matter which in the circular section sometimes tends to obstruct the flow.

A further advantage of this section is that for the same capacity its horizontal diameter is less than in the circular form, which makes possible its construction in a narrower trench. This, of course, in the case of deep trenches, means a saving in excavation. On the other hand, it must be remembered that the vertical height is greater than in the circular type. It is a more difficult type to construct, owing to lack of stability and liability to crack, and in yielding soil it requires more masonry at the haunches to support the arch. In good stiff soil or in rock this may not be necessary.

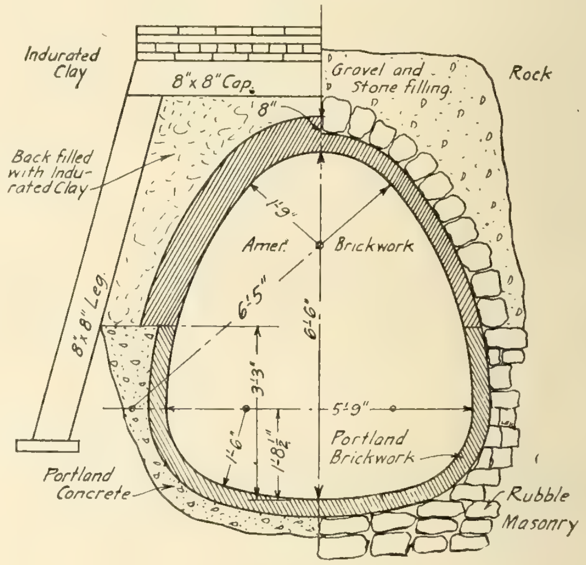

Fig. 2—Typical catenary section

There are several forms of the egg-shaped section. The standard form Fig. 1, was designed in England over half a century ago, by Phillips, and has been popular. Mr. Phillips also designed a modification for use where the normal flow is small in comparison to the maximum, but this has not been so generally used. Other modifications in an effort to afford additional head room or to provide for special variations between the normal and the maximum flows have been made. While some of these forms have found favor abroad, they have been little used here. In general the egg-shaped section, while probably as near the ideal form of hydraulic standpoint as any yet devised for variable flows, is somewhat more expensive in general than the circular, and far more so than some of the other types to be described.

Catenary Section

This is primarily advantageous in that it conforms so nearly to the available space inside the wooden timbering in earth tunnels, see Fig. 2. It has also the advantage of strength, its line of resistance lying well within the arch section. Its hydraulic properties are fairly good, and the fact that the center of gravity of the wetted area lies much lower with respect to the height than in the case of the circular section results in the possibility of making lateral connection at a lower elevation or of raising the invert of the main sewer, in cases where it is planned to operate the lateral sewers under a head when the main sewer is running full. In general, however, such a scheme should be regarded with suspicion, though it is certainly an advantage where the allowable difference in water level is small. This type will carry a greater quantity for a given increase in depth than the circular sewer.

Gothic Section

Another section, Fig. 3, used to some extent, is the Gothic, which in shape and advantage closely resembles the circular. Its horizontal diameter is about 17 per cent less and its vertical diameter about 8 per cent more than the diameter of the equivalent circle, so that this type requires less width of trench than the circular. Where the sewers are to be located on the basis of the crown grade, however, the greater heights of the Gothic section, necessitating undue excavation, would usually preclude its use. Its hydraulic properties are very similar to those of the circular section and its pointed arch is somewhat stronger than the semi-circular arch.

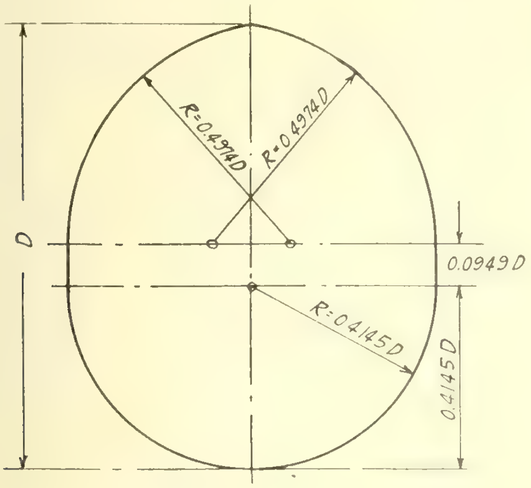

Fig. 3—Typical Gothic section

While this type is not in general use at present, it possesses advantages which justify its consideration for special cases.

The Basket-Handle Section

Fig. 4 is another type somewhat extensively used. Mr. Carson, who developed the section, says of it:—

"The horizontal diameter is about 6 per cent less than the vertical. The arch is slightly pointed and the invert is flatter than a semi-circle. In this shape the area, perimeter and the theoretical velocity when flowing more than one-sixth full differ but little from the corresponding elements in a circle having the same height. In actual construction, under the conditions that usually obtain on our work, this shape is more stable, when entirely completed, than a circular shape. It requires more care, however, to prevent injury to the invert, while the latter is being constructed."

The basket-handle section closely resembles the horse-shoe type next to be described, and has about the same advantages and disadvantages. Its Gothic arch gives slightly greater strength and greater ease in removing the collapsible forms. The large radius curve of its invert and the rounded corners between the side walls and invert may also afford some additional strength, but the horse-shoe type so nearly approximates it in this respect and is so much easier of construction that it is usually used in preference.

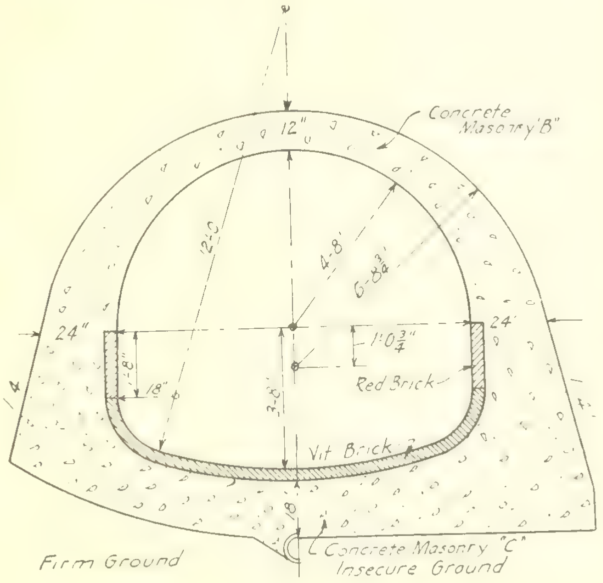

Fig. 4—Typical basket-handle section

The Horse-Shoe Section

Next to the circular, the horse-shoe section, Fig. 5, is probably the most popular type. While many modifications have been made, in order to adapt it to special conditions, in general it consists of a semi-circular arch upon side walls inclined inward and having either a plane or a curved surface. The invert surface varies in section from a horizontal line to a circular or parabolic arc and is so constructed as to concentrate the low flow near its center. In yielding soil it has the advantage, over the circular and egg-shaped sections, of conforming to the trench bottom, so that its arch does not require masonry backing. It may also, for a given width, or horizontal diameter, be designed with less height and still carry the same quantity of sewage as the circular section. This decrease in height would result in a saving in excavation in cases where the depth of the sewer below the surface is controlled by the crown grade. Especially where the head room available is restricted, this wide low horse-shoe type is often advantageous, as it is also in yielding soil where spread foundations are required, as here it affords economy in masonry of the invert. So it is possible to broaden out and lower this horse-shoe type until the diminishing side walls disappear and the section becomes semi-circular.

Unless this section is built on a very firm foundation where the invert or base of the side walls will [illegible] supported as to maintain the line of thrust within the section, the whole structure will act as an elastic arch from center of invert to crown, endangering the stability of the arch. To obviate this lateral thrust it is sometimes necessary in compressible soil to make the side walls extremely heavy. The effect of these side walls is to greatly increase the bending moment at the crown and at the center of the invert which will come very severe, especially at the invert center and at the springing line, if the sewer is constructed monolithic of reinforced concrete with the reinforcing bars continuous from center of invert to crown of sewer.

In compressible soil heavy side walls or abutments are also necessary. Reinforcement of the concrete has helped to obviate this trouble, but even in the sections heavily reinforced there have been instances of the arch cracking on the inside of the crown and on the outside at the quarter points or near the springing line. Though failure of the arch did not result in these cases, the condition is objectionable as it permits leakage and possible rusting of the reinforcing steel.

The stability of brick arches in relation to the passive resistance of earth has been discussed by Mr. Alphonse Fetley in a paper entitled "Stability of Brick Conduits" to which reference should be made by those interested in examples of the effect of yielding abutments on the arch.

The Semi-Elliptical Section

This may be either a true semi-ellipse or may be composed of three circular arcs approximating the semi-ellipse. Its chief advantage over the other sections lies in the fact that under working conditions the shape of its arch more nearly coincides with the lines of arch resistance. Hence the arch section can be made relatively thin without creating excessive stresses in the masonry. Unlike the horse-shoe type, this section depends but little on the lateral pressure of the earth, and not at all upon the passive pressure or natural resistance of the earth filling. It also has the advantage over the circular type of a lower, normal flow, since the center of gravity of the wetted area is lower with respect to the crown. Its use is advantageous in earth tunnels, where the usual form of timbering is used, since like the catenary this type conforms readily to the available space.

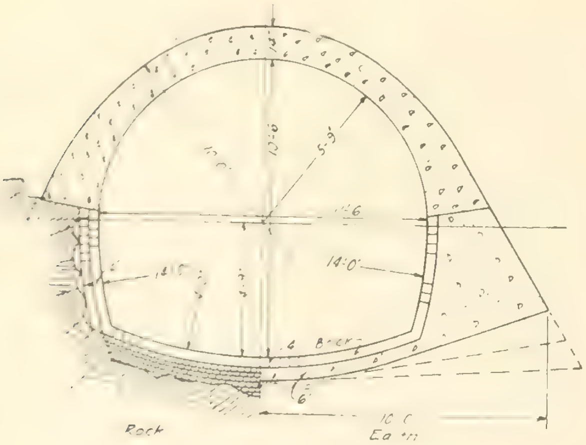

Fig. 5—Typical horseshoe section

With respect to the invert, in this type, its stability is more important than the other types thus far discussed, as the arch is so thin in section and extends nearly down to the invert line, making necessary the distribution of the invert pressure over a large area. In cases where the section is constructed in compressible soil and the sewer is monolithic (with steel reinforcing bars running continuously from center of invert to crown of sewer) the invert should be made as thick as the arch, at the springing line, and should be heavily reinforced to resist the large bending moment of the invert center. Otherwise cracks may occur at this point. The quantity of masonry below the springing line is not excessive in this section, for, like the horse-shoe type, its invert conforms to the trench bottoms.

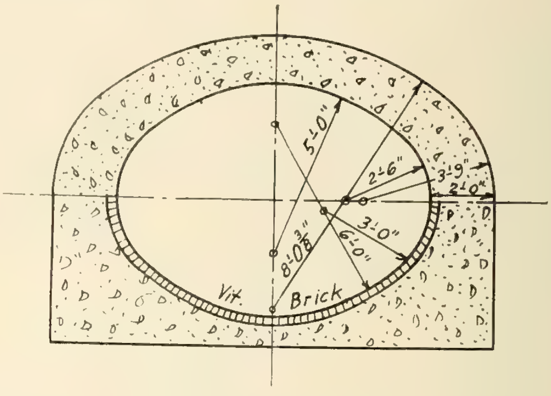

Fig. 6—Elliptical section

While the hydraulic properties of this section are in general very good, its wide and shallow invert does not afford as high a velocity during times of low flow, as does the circular section. Where the amount of sewage to be provided for is not liable to wide variations and the normal flow is equal to or greater than one-third of the total capacity of the sewer, this disadvantage may be disregarded. In fact, for sewers constructed of reinforced concrete and over 6 ft. in diameter this type is one of the best.

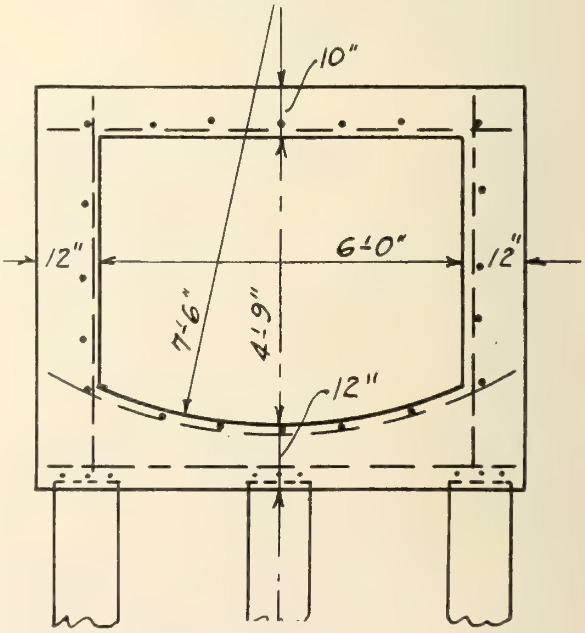

Fig. 7—Rectangular section

Elliptical Section

There are a few sewers built with an elliptical section. This section, both above and below the springing line, approximates a portion of an ellipse, the longer axis being sometimes vertical and sometimes horizontal. In general the elliptical section has so little to commend it that it has not proved popular. It has the same disadvantage as was mentioned in connection with the egg-shaped section, that unless it is built in very firm soil additional masonry backing will be needed under the haunches, to support the arch.

The U-Shaped Section is used to a limited extent for sewers in the vicinity of 3 ft. in diameter. Undoubtedly it offers some advantages where the width of the trench is limited, and where there is sufficient head room available to build a sewer with the horizontal diameter much less than the vertical. Its hydraulic properties, also, are fairly good though when it becomes filled the hydraulic mean radius is materially reduced to the addition of the width of the slab roof to the wetted perimeter. Its pointed shape affords greater ease in the removal of forms than is the case with the circular section, and the invert is of such shape that good velocities are obtained at times of low flow.

The Rectangular Section

Fig. 7, the rectangular section, has been used for many years to meet special conditions, as where the head room or side room in the trench was restricted. It is easy of construction, economical of space and of masonry, and has good hydraulic properties up to the point where the flat top becomes wet. Just before this point is reached, the velocity and discharge are relatively large, but they decrease rapidly as soon as the wetted perimeter is increased and the hydraulic radius decreased by the wetting of the top. Hence, it is usual in designing these sections to provide for an air space of from 3 to 12 in., above the maximum flow line.

This type is of special advantage in deep rock cuts. The usual form has a less height than width but the hydraulic properties of this section become less favorable as the ratio of height to width increases. There is an advantage in the narrow, high section, as this permits reduction in the width of excavation often sufficient to more than offset the increase in depth of trench.

This type of section requires care in design, in order to ensure its stability. If the top is built in the form of a flat slab it must be designed as a beam to provide for the earth load and the side walls must be strengthened to resist lateral pressure. If designed as an arch it is necessary to strengthen the side walls to withstand the thrust.

The flat slab top may be constructed either of I-beams encased in concrete, or as a concrete slab reinforced with bars. The first method, while not economical of steel as the I-beams must take all the load, the concrete merely acting as a filler, is of advantage in that it is possible to complete the sewer and backfill the trench more quickly than where the roof is built as a reinforced slab. Also, the beams are easily and quickly placed, and it is claimed in certain cases this ease of construction offsets the additional cost. In the case of a large sewer built in a congested district the advantage of speed, permitting prompt backfilling of the trench, may be an important factor. However, the method of construction requires great care to protect the steel from rust.

Quite frequently the rectangular section is constructed with a V-shaped invert, to gain greater velocity for low flows.

Semi-Circular Section

The semi-circular section, though not as popular as the rectangular, is being rather extensively used. Its hydraulic properties are not equal to those of the rectangular section, and it requires a wider trench and more extensive foundations for equal capacity and height, than most of the other types described. Its use is most advantageous for out-fall sewers crossing low lands, where the natural surface of the ground is largely below the top of the sewer arch or even below the invert. The invert must be firm and designed to resist the thrust of the arch. Consequently this type as a rule requires more masonry in proportion to the capacity afforded, than do the other types. In some instances two or more semi-circular sections have been built side by side, in order to save head room.

Double and triple sections are especially useful in the case of outfall sewers in thickly settled districts or where a storm-water sewer is constructed above or below a large sanitary sewer, for the sake of economy in excavation, or head room, or to meet other special problems.

Methods of Design

The inside shape of a concrete sewer is often a compromise between the best hydraulic shape, the best shape for structural strength with economy, a shape which is easy to build and conditions of height imposed by head room or hydraulic conditions.

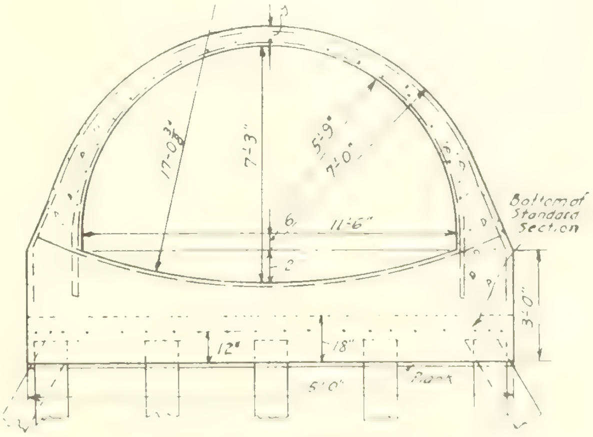

Fig. 8—Semi-circular section

Up to a diameter of 6 ft. a circular shape will frequently meet these conditions satisfactorily. As the size increases, more attention must be given to the shape for structural strength.

In large sizes with flat inverts (dictated by ease of construction) the intensity of soil pressure at any point under the invert requires careful study to determine the thickness and amount of reinforcement. This also will be a factor in deciding whether the sewer is to be analyzed as an elastic ring or the top analyzed as an arch with fixed abutments.

The water in the sewer must be taken into account in determining the stresses on the sewer ring. This is especially important with light cover and heavy eccentric loads. Also conditions during construction or later may occur when the water may exert a bursting pressure and require reinforcement to resist it.

The mathematical methods of sewer arch analysis are given in textbooks.

Economy may be shown by revising the trial sewer shape to make the line of resistance for the normal dead load condition fall within the middle third of the arch ring.

It is usual to specify that the sides of the sewer below the springing line and the bottom are to rest against the undisturbed soil or against the sheeting left in place. While this allows the arch to be supported by the passive soil pressure, it is better practice only to figure on the active soil pressure as some deflection of the sewer or movement of the soil must occur before the passive pressure comes into action.

Conditions Must be Studied

The design of the sewer section necessitates a study of the conditions under which it is to be built and under which it is to serve. Both live and dead load have to be considered carefully. In large construction, with shallow cover, the live load, as from auto trucks, road rollers, street cars or railroad locomotives, may be extremely important. In deep cover, the live load is of less importance. Soil conditions also enter in. Hence the importance of trained judgment, especially on the larger problems. In general the horizontal earth load to be used in the design may vary with soil conditions from one-third the vertical load in a relatively stiff soil, to a load in quicksand increasing uniformly with the depth, on a basis of approximately 100 lb. per sq. ft. per. ft. depth. This loading is more intense than a water load.

For the surface loadings, allowance must be made according to local conditions. On city streets, street cars and twenty-four ton trucks may need to be provided for. On shallow depth sewers unsymmetrical loadings should be investigated. This has become particularly important because of the increased weight of loaded truck. The loads should be considered from the standpoint of the crowded street, which, of course, lessens the reduction made by any allowance for distribution of load through the earth cover.

Analysis of Stresses

On the smaller sections, say up to 6 ft. internal diameter, practice on uniform soil in different localities has demonstrated in part a reasonable section. However, special conditions may necessitate a thorough analysis of the stresses. On the larger sections, say 6½ ft. and upwards, a special analysis of the stresses is desirable, and parctically so with sections 8 ft. in major dimensions and larger. Such analysis can be made along the lines of the elastic theory or the modified method suggested by Metcalf and Eddy (American Sewerage Practice, Vol.1) may be used except where eccentric loadings have to be investigated. In some cases, the old voussoir method of analysis still has application in the study of lines of stress in the sewer ring. The larger the section, the more careful should be the analysis of the stresses and a complete consideration of all details entering in, the condition of the ground, kind of backfilling with possibility of abnormal stress of unbalanced backfill and the type of loading to be evpected.

When the analysis has been made, consideration should be given to future conditions of operation and maintenance. On sewers carrying special industrial wastes or very septic human sewage, or exposed to extremely high velocities, a factor of protection or additional thickness, over the theoretical may be well worth while.

Standard Sections

In any given locality, where the soil conditions are reasonably uniform, standard sections and thicknesses may readily be worked up. Such standardized sections may be run in size from tile pipe 6-in. diameter up to sections with a major dimension of say 6-ft. Such standards will also require occasional adjustment, where special sections are required, for hydraulic reasons.

Plain vs. Reinforced Construction

The structural properties of concrete are such that for a structure subject to possible bending, as a sewer may normally be, the basic condition on the elastic arch theory leads to a reinforced shell. Where direct compression combines with the bending moments in a way to eliminate tensile stresses, a condition of zero reinforcements occurs. It is probably true that many extreme designs of concrete and of brick sewers are standing after incipient failure, because of the passive resistance of the earth at the haunches. This makes necessary a close scrutiny of the character of the soil, whether hard or soft, in working up a design.

In hard material with sufficient cover, the shape of the sewer arch can often be arranged to conform to the load line found by analysis. This may save reinforcing.

Rectangular sewers will always require reinforcing in the top beam, unless this is so thick that arch action occurs, which may not be economical. The sides and bottom will usually need reinforcing also, particularly in the softer materials.

As a general rule in the smaller sizes, from three up to eight ft. in diameter, contractors prefer to build monolithic concrete sewers, without reinforcement. This makes for simplicity and speed in construction, as the concrete usually can be deposited more quickly than the steel can be placed. Plain monolithic concrete is most suitable in trenches of moderate depth, in firm soils, with light live loads, in locations where no restrictions are placed on head room. While monolithic sewers have been built in firm soils up to 17-ft. in diameter, without reinforcement, bottom conditions or special loadings may dictate a small amount of steel as insurance. Certainly in large sewers from ten ft. up steel reinforcement is often desirable and generally used. The cross-section of concrete is thereby reduced. Structurally reinforced concrete sewers are applicable to all conditions of soil and loading. An analysis of cost under these particular conditions may show the best course to pursue. In the design sometimes cases occur where the invert alone may need reinforcement and again where the arch alone may need it.

In the field the use of reinforcing steel to meet unexpected soil conditions may make local use in any sewer worth while. In soft soils the sewer must act as an elastic ring rather than an arch, in order to distribute the load over the foundation. This condition will usually require some reinforcement except in the very small sizes.

Reinforcing Steel

The reinforcement is generally a steel bar of some kind, plain, twisted, or deformed. Round and square bars are in use. The quality of the steel used is covered by excellent general specification, of the American Society of Testing Materials, as well as by the standard sewer specification of the American Concrete Institute. Many designers prefer a high carbon steel with high elastic limit, others a medium steel. All usually prefer new material, of open hearth manufacture. Ability to bend readily is a usual test. Brittle steel is not desirable.

In sewer construction of any size, bar reinforcement is used rather than mesh. Except in very small sewers, the mesh does not supply enough steel to meet the needs of the designer. This is also because of the amount of steel required in one direction across the arch. Only sufficient longitudinal steel is required for spacing and shrinkage or temperature stresses during construction. The amount of longitudinal steel varies with the designer and the condition, in some offices as low as 0.1 of 1 per cent of the cross-section has been used. For tight work free from cracks as high as 0.4 of 1 per cent is used.

The handling, storage, and placing of steel are matters generally put up to the contractor. However, the steel should be handled to prevent unnecessary bending and stored to prevent useless rust, which may later need to be cleared away. In the placing, various methods have been used. The steel may be secured to the forms by steel chairs, or wired to the spacers which separate the forms. Occasionally bricks or blocks of wood are used. These are likely to be displaced and necessitate watching. The use of chairs or spacers of steel to be left in should be encouraged.

In the larger work, bending of the steel at the mill or shops is very common. In the smaller sizes, bending on the job is frequent.

Stock piles conveniently located and plainly marked are very serviceable.

Influence of Soil Conditions

Soil conditions are one of the most important points in the design of a sewer. While soil conditions may be learned approximately by borings and preliminary exploration, the true soil condition is often not learned until every foot is opened up. While soil conditions materially influence the design of the invert in most types of sewers, they have a most important bearing on all arch design, unless the arch is made self-contained as was done in the early days in brick sewer design. Consequently a knowledge of soil conditions is all-important.

In hard stiff soils, like blue clay, where complete and stiff backing can be obtained with concrete, a thinner section can be used than in loose running soils or compressible material. In all soils care should be taken to have the backfill thoroughly compacted on the haunches, unless the sewer is so designed as to minimize the value of this precaution.

In rock a sewer invert may be called upon to take but little stress. In stiff soils, the invert will distribute readily the load from the sides without making heavy stresses. But in compressible soils, the invert may require special design and reinforcing to distribute evenly, the weight of the sides and the bending movements of the soil material without cracking. For this purpose and in emergencies, reinforcing steel is very useful.

In very soft foundations, where thickening of the invert or reinforcing with steel will not suffice, plank foundations, alone, or plank on piling may be required. The extent and amount of timbering or piling depends on the local conditions and should be governed by ripe experience. Plank foundations are often made with 3-in. plank laid on the trench bottom, in two layers crossed. Where piling is required to bridge sand pockets, mud or similar material the piles are driven first. On the pile bents waling stays may be spiked, on which are laid longitudinally plans to sustain the concrete until thoroughly hardened.

The judging of existing and future soil conditions is one of the hardest problems of sewer design and requires experience with similar soil and judgment to determine what loading can be expected on the sewer. In very soft soil, conditions during construction may call for foundation piling or planking that will not be required after the sewer is completed and the trench backfilled, as the completed sewer fill of water will not differ by a large percentage from the weight of the soil displaced. The sewer empty may even show a figured tendency to rise or float. This leaves the foundations under the sewer with the sole use of preventing unequal settlement. With longitudinal reinforcement the sewer, especially the side walls become continuous girders that will bridge over small soft spots.

Belt Conveyor Handles 3,500,000 Tons of Coal in Nine Years

Most unusual service on the part of a belt conveyor was disclosed some months ago when a fire broke out in the coal handling division of the Inland Steel Company's Coke Plant at Indiana Harbor, Indiana. This fire completely destroyed the 300 foot inclined belt conveyor and gallery which formerly handled the coal from the crusher house to the mixer house.

The installation of belt conveyors was made by Link-Belt Company of Chicago in 1913 and at the time there was considerable discussion regarding the probable durability of the 36 in. wide 8 ply material that was offered for the work. To overcome this doubt it was necessary for the Link-Belt people to guarantee a handling capacity of 1,500,000 tons of coal for each belt. In the nine years that intervened, however, each belt handled approximately 3,500,000 tons, and from reports, were in fair condition at the time of the fire.

North York Waterworks

At a special meeting of the council of North York Township, Ont., a few days ago, tenders for the new water supply system, to be installed this year, were awarded. The total cost, according to tenders, will be $105,557.05. The following firms were the successful bidders: A. R. Campbell & Co., dam, pumping house and filtration plant, $39,230; Bawden Machine Co., pumping machinery, $12,117; International Filtration Co., filter equipment, $12,050; Horton Steel Co., elevated steel tank, $16,300; National Iron Pipe Co., cast iron pipe, $19,000; Roco and Co., tank foundation, $2,065.75; Roco and Co. and Rusicco, laying mains, $4,426.80. The hydrants and valves tender, for which the lowest bid was $36,750, was not let.

The Association of Municipal Electrical Utilities meets at Orchard Point Inn, Atherley, Ont., on June 13 to 15.

Salvage and Maintenance of Macadam Roads

The Problem of Keeping Stone Highways in Shape is One that Demands a Competent Organization Properly Equipped—Pennsylvania's Experience

The development of road construction and the necessity for intensive maintenance is directly attributable to the increased motorization of traffic. The problem now confronting highway engineers, and which has confronted them for the past decade, is to keep pace with this increase.

The finances available for road construction have of necessity limited the building of durable types of pavement and, therefore, road authorities, who have the comfort of the traveling public at heart, are applying modern methods of maintenance to some of the older types of construction, with varying degrees of success.

The problem in Pennsylvania has not differed to any extent from that in other localities, except that the stone road mileage is greater on account of the large number of toll roads that were included in the original highway system. By legislative enactment approved May 31, 1911, 8,800 miles of highways in Pennsylvania were taken over for construction and maintenance at the entire cost of the State. Of this 8,800 miles five hundred and twenty-one were toll roads built by various corporations during the past century and in the main were of the macadam type of construction. The mileage of other macadam roads totaled twenty-one hundred.

The majority of the toll roads and a great many of the other roads acquired in 1911 were very narrow, in some instances not over twelve feet in width. There was a woeful lack of both sub- and surface drainage. A comprehensive survey of the condition of the roads was made in 1915 and a definite policy established with regard to a program of resurfacing and reconstruction. It was felt that if the State was to have a connected system of highways a certain amount of resurfacing of the old stone roads should be taken up each year, and the demands of traffic compelled the Department to find some methods of resurfacing in addition to the waterbound macadam or penetration types. It was early shown that our finances would not permit the resurfacing of sufficient mileage with either of these types to give the required results in the desired time. It was, therefore, determined to use the waterbound and butuminous macadam upon the heavier traveled routes, while the unbound macadam, which will be fully explained later on, is used upon the secondary or less traveled roads.

Organization and Planning

In order to properly carry on the maintenance work and to provide for the increase, which would surely develop, a modern organization was established which places the responsibility for the maintenance of these roads upon fifteen district engineers, reporting to the maintenance engineer, and fifty-three superintendents, working under the direction of the district engineers. Under the superintendents are foremen, caretakers, laborers, etc.

We have always given a great deal of attention to the proper planning and outlining of our maintenance work, which consist chiefly of the reclamation of stone roads. Systematic and thorough surveys of local materials have been made in all parts of the state and tests taken to establish their relative values. When it is impossible to obtain local material, quotations are secured from commercial quarries and the stone is shipped in. Wherever possible mechanical means of unloading material have been adopted.

A careful and accurate traffic census was early inaugurated, which has been of considerable assistance in determining the type of repairs. It has been our experience that the proper surfacing of a road will create a traffic out of all proportion to the seeming importance of the roadway.

Equipment

At the beginning of the year a thorough study is made of the total amount of work in each district, and the necessary equipment required, such as rollers, trucks, etc., after which a schedule is made up for each job showing the length of time that the equipment will be in operation upon each specific authorization. By this method we have kept our Department equipment operating continuously, thereby reducing to a minimum the necessity of renting machinery.

Base Survey

Before the actual operation of waterbound macadam or bituminous macadam resurfacing is taken up, we establish by actual measurements the depth of stone in the existing roadway. In places where water breakers are found they are removed. Test pits are excavated to the bottom of the stone in the center and measurements are taken on each side for a distance of half the width of the road. These pits are dug every twenty-five to fifty feet, depending upon the type of road. After this work is completed the base is widened out, and in places where sufficient foundation is not shown, additional stone is added to bring it up to the required depth. Then the road is scarified lightly and reshaped with a road machine. The base is brought to a true cross section and grade by the use of a crown board and steel pins are driven every ten to twenty feet, depending upon the profile, and a cord stretched along the edge and to the top of the proposed ballast. Berms about four feet in width and from one inch to two inches above the line are then built up.

Waterbound Resurfacing

Our experience has shown that more satisfactory results are obtained by the use of large stone for waterbound macadam resurfacing; that is, stone varying in size from one and one-half inches to three and one-half inches. The material is dumped upon the sub-grade and forked, thus eliminating the danger of the segregation of the sizes, which is the cause of a great deal of subsequent patching. The stone is built to a crown board and then thoroughly locked with the roller after which the screenings are applied fanwise with a shovel and rolled until the voids are

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[illegible] Dezer, Assistant Maintenance Engineer, [illegible] Department at the annual convention of [illegible] Association.

thoroughly filled. The water is then applied and the road rolled until the mortar is flushed or puddled and the road is then allowed to set before surface treatment.

The maintenance of the road during the time that it is setting consists principally of sweeping, either by caretakers or lightly by mechanical brooms or horse-drawn sweepers. The sweeping is done for a dual purpose: First to remove the caked or matted screenings from the edges, which must be done in order that proper penetration of the surface treatment material may be obtained, and second to replace these screenings in the center of the highway from which they have been removed by the action of traffic, which will prevent the road from ravelling and assist in compacting it. Under especially heavy traffic it is found necessary to add screenings and during hot weather horse-drawn sprinklers can be used to advantage.

Surface Treatment

Previous to the first application of the bituminous material, which we believe should give the maximum penetration, the screenings must be removed by sweeping so that the voids will show between the ballast to a depth of possibly a quarter of an inch. Material must be applied in two applications with a pressure distributor, the first one to be approximately one-third of a gallon to a square yard and the second from two-tenths to a quarter of a gallon as the road requires. It has been shown in some cases that a third of a gallon applied will penetrate the road from a quarter to five-eighths of an inch, this penetration depending upon the kind and cementing value of the stone. The second application will heal up the spots that are not thoroughly bonded, but will not fill the voids. Although we do not ordinarily apply chips upon the first treatment, skid chipping is desirable as a safety measure on heavily traveled roads by applying from five to ten pounds of chips to the square yard.

In order to obtain the best results, our experience has been that three successive treatments should be made; that is, the first year the treatment described above, and providing the road is subjected to extremely heavy traffic, a second treatment is given the same year, and the third the season following.

The second treatment should be a high viscosity bituminous material, the quantity just sufficient to properly fill the voids and this can only be determined by experience, but in most instances varies from twenty-five hundredths to three-tenths of a gallon per square yard.

Hard stone chips, ranging from a quarter of an inch to an inch in size, dustless and free from dirt, should be used as a covering at the rate of from twenty to thirty pounds per square yard, or approximately one cubic foot of stone chips to one gallon of bituminous material.

Owing to the large chips used and to assist in compressing them into the bitumen, the treatment should be rolled with either a five to eight ton tandem or a ten ton macadam roller, as soon as the chipping is completed, but, if a material that does not dry rapidly is used, we believe that equally good results can be obtained if the road is rolled from twenty-four to thirty-six hours after the bituminous application.

The third treatment may be either a high viscosity coal tar, water gas tar or asphalt, or as an alternative, a hot material. We apply from fifteen hundredths to twenty-five hundredths of a gallon per square yard of the hot material which requires from thirty to forty pounds of chips. This treatment must be watched carefully as the road will bleed after being thrown open to travel and, if not given proper care, will pick up under tire wagon traffic. I have known instances where a treatment of this character applied late in the fall required rechipping at the beginning of the hot weather in the spring. We have found that stone chips for covering give the best results.

Bituminous Macadam Resurfacing

The reclamation of the old base for bituminous macadam resurfacing is taken up practically in the same manner as the waterbound. After the road has been brought to a true cross section, approximately three inches of stone, varying in size from an inch and a half to two and three-quarter inches is spread to a depth of three inches. This is locked by rollers and then the bituminous material is applied at the rate of one and three-quarters to two gallons to the square yard, depending upon the kind of material used. Stone is uniformly spread, varying in size from five-eighths of an inch to an inch, which is properly rolled and a seal coat of from a half to three-quarters of a gallon per square yard of bitumen is then applied and chips of approximately one-half inch are spread over the surface. The road is then rolled until it is properly bonded.

In some instances we have prepared a base, employing practically the methods of waterbound macadam construction, even to the extent of an application of bituminous surface treatment of a material giving the maximum penetration. On the base so prepared we placed a hot mix of either sheet asphalt or asphaltic concrete.

Unbound Macadam

The unbound macadam, which we have used with good results on secondary roads, is considerably cheaper than the waterbound construction, and for one or two seasons gives very satisfactory results. The method usually employed in the construction of unbound macadam is to scarify the old surface, shaping it up with the road machine and rolling until a firm foundation has been obtained. Stone, clear of dust, varying in size from one-half inch to an inch and a half is piled along the side of the road. Just ahead of the distributor, the stone is spread uniformly to a depth of approximately two inches. Where possible traffic is kept off, or at least confined to one side. Then apply from one-third to two-thirds of a gallon per square yard of bituminous material with the proper penetration, or a larger amount where two applications are made, which is governed by the depth of the loose stone and is varied accordingly. The material is allowed to dry for from one to three days and then rolled, and providing a larger amount is required to properly seal the road, two tenths of a gallon to the square yard is applied. Under traffic it becomes comparatively smooth and little difficulty is experienced through rutting.

We know of no type of construction that required more uniform and continuous maintenance than stone road. The advantage of thoroughly experienced workmen is unquestionable. Care must be exercised to perfect the organization and seeing that proper instructions are issued covering each phase of the work.

There are two general systems in vogue in the maintenance of these roads, both of which have their advantages. First, the caretakers or patrolmen; the other, the patrol crew or gang. The first, of course, comes closer to the ideal if properly controlled. This plan arranges the road mileage in sections three to five miles in length, each section in charge of a patrolman provided with the necessary tools, materials, etc., whose duty it is to take care of the small repairs and emergency work and with authority, when necessity demands it, to hire additional men, teams, etc., upon instructions from his immediate superior. These caretakers keep the surface patched, all depressions filled, see that the side gutters and cross drains are kept open, and paint slight surface depressions and sprinkle with chips tamped in place. Larger depressions are filled with large stone and then topped with patching tar and chips, the mix varying in proportion of one to twelve or one to fifteen, depending to some extent upon the weather. The patrolmen or caretakers file daily report cards, giving the character and extent of their work, hours engaged and nature of work performed.

The patrol gang is an organization of picked men, provided with tools, materials, etc., to maintain various lengths of road mileage. It is probably more economical than the caretaker system, the men being well trained for each class of repair work. The difficulty experienced in this kind of maintenance, however, is that it is impossible for a force of this character to give each section the required attention at the proper time, especially in emergency cases. The particular advantage of the gang system is an insurance against shortage of labor, especially on those sections of road lying in sparsely populated districts. The control can be taken care of by operation reports.

The success of stone road maintenance depends upon organization, equipment and material, a thorough knowledge of conditions and a desire, from the executives down to the humblest workmen, to give real road service.

How Should Terminals be Designed?

The Requirements of Locomotive Terminals from an Engineering Point of View—Important Problems that Demand Consideration—Remodelling of Old Terminals

By W. T. KRAUSCH
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The development of the locomotive in later years has been very marked, especially as to size and power or capacity. On the other hand, a great many locomotive terminals were designed, developed, and constructed before power of this much heavier type was even thought of or considered. Consequently, in many cases we are all confronted with this problem; and, before analyzing the new terminals, let us briefly consider some of our present older facilities.

(1) The locomotives or engine terminal at a division point controls the amount of traffic that can be handled over a division, or the service that can be furnished by the transportation department. In other words, it is our capacity for doing work.

(2) Locomotive statistics show that more than one-half the time of the locomotive is spent at terminals, namely, engine houses, clinker pits, etc.

Now then, with these facts confronting us, we must act; and in this connection we should first consider what improvements and results will be obtained by redesigning the older locomotive terminals where it can be done successfully.

Results from Remodeling Old Terminals

The redesign and improvement of the older terminals (where it can be done) will, I believe, produce quicker and more far-reaching general results—and this in a great many cases at a moderate cost. Of course, where the facilities are such that proper redesign cannot be developed and results obtained, then the new terminal is the only remedy.

We will, for example, take two terminals—the one an older terminal, remodeled and improved; the other a modern terminal, both installations made recently. We will consider the older terminal as Example A and the modern terminal as Example B.

At A we have a 15-stall roundhouse, 70-ft. turntable, 5 per cent incline-type coal station serving two tracks, one shovel cinder pit, fairly good water facilities with water of good quality, washout facilities, power plant, stove sand-drying facilities and drier, fairly good lighting and heating, small machine shop and blacksmith shop, turning approximately 50 locomotives in 24 hours. This terminal was improved and remodeled in 1921 at an approximate cost of $90,000. The improvement consisted of additional leads to and from the roundhouse; increasing size of turntable; installing a 2-pit, cast-steel bucket cinder pit with overhead traveling crane; a modern steel mechanical coal station, handling two kinds of coal and serving two tracks; improved water facilities, by additional storage and crane; improved sand facilities; and improved wash, locker, and toilet facilities, bunk houses, etc.

What were the results? We turn approximately 50 locomotives in 24 hours, and reduce the time of turning a locomotive by about one-third.

How it is Possible to Get Good Results

This simply illustrates what may be accomplished in making certain improvements at a moderate cost. It must also be understood that it is a most difficult thing to make comparison between two terminals, because it rarely occurs that two terminals are likely to operate and function under the same conditions. Consequently do not mean to construe that our example A in any way reflects a comparison between the two terminals considered as A and B, as each terminal is an entirely distinct and different problem. Example A, however, does indicate how it is possible for the engineering department to co-operate with the mechanical and transportation departments, analyze the conditions, and develop or redesign an improvement at a moderate cost and produce most satisfactory results. For instance, in studying out the problems, it is possible to use a turntable from another point, which will function perfectly at the improvement considered where lighter power is handled.

At terminal B we have a modern improvement erected in 1918, consisting of a 25-stall roundhouse, 100-ft. turntable, two 150-ft. clinker pits, two 100-ft. wash tables, one 100-ft. inspection pit, four tracks leading to and from roundhouse, modern mechanical coal station, sand plant, good water facilities and water, good wash-out system, modern power plant, good heating and lighting, and proper facilities for all men, locker, washroom, toilet, bunk rooms, lunch rooms, etc. We turn approximately 50 locomotives in 24 hours, and turn a locomotive in approximately four hours at this terminal.

The remodeling and improving of older terminals means greater flexibility, more leads to and from the roundhouse to avoid congestion; improved modern cinder, coal, water, and sand plants; turntables of right size, equipped electrically whenever practical; shop facilities, equipped with modern machinery; roundhouse, equipped with overhead cranes, jib cranes, and drop pit installations; and power-plant development.

One very important factor is to consider that the operation is for 24 hours and that night work is the more inefficient, due to natural causes. Good modern electric light, properly distributed, is an absolute necessity, not only in the roundhouse, adjacent shops, storehouse, etc., but particularly on the outside at the leads, at the coal, water, cinder, and sand plants, and wherever work is performed. The storehouse supply facilities must be adequate and thereby avoid delay in securing the materials and necessary parts required.

In the cold winter months, with its short daylight period and long nights, just imagine a master mechanic with an old roundhouse, the stalls so short they cannot close the doors, trying to heat it with steam heat, and men working around in the steam vapor with torches, a shovel clinker pit and a hand shovel coal chute—say with 5 per cent incline—and a short turntable and torches for all outside light. What results does he get? How long does it take him to turn power?

In what manner does the engineering department meet the requirements of the transportation and mechanical departments in cases like this? Well, in some cases I am told, just about like this:

Here is a fellow by the name of Jones, a sick man; in fact, he hardly can keep up, but keeps on plugging just the same. One day he passes his family physician on the street, the doctor is astounded, turns about, and looks at Jones as he passes by, shakes his head and says to himself: "I am afraid Jones is a pretty sick man," and goes on. The doctor won't diagnose and prescribe until Jones calls him on the 'phone, or makes a call.

Now then, with the railroad we have the doctors right on the payroll, and the only way to get results is to get the railroad Bible, and turn to commandment No. 1: "Get together—Stay together—Pull together." That means engineering, transportation, and mechanical departments. Analyze the conditions, and after this is done in a satisfactory manner, suggest the solution. Its answer in dollars saved will appeal to the executives. There is no management of any industry, especially the railroads, who will turn down improvements showing results and savings.

In this locomotive problem we must also consider another vital matter, and that is, the 24-hour day. The corporation which manufactures electric current for a 24-hour period, and has a good load under ordinary conditions, can furnish the average railroad terminal electric current for power and light at a rate about equivalent to what it would cost the railroad company to manufacture, including interest, depreciation, taxes, and maintenance.

In order, then, to turn the locomotives it is just as necessary to work along the same lines, based on your load, which is locomotive power. If you work on one locomotive and leave four or five lie idle, because you have not got the help and because you are trying to do your work in 8 hours, 12 hours, or 16 hours, then you are wrong, even though the remedy exists. There are many things that can be done to bring about better results, such as

(1) Additional track facilities with leads to and from roundhouse;
(2) Good washout facilities;
(3) Drop pits;
(4) Modern clinker pits;
(5) Good water service and storage;
(6) Modern coal and sand plants;
(7) Good drainage;
(8) Proper ventilation;
(9) Modern heating installation;
(10) Modern artificial lighting installations inside and outside;
(11) Good daylight;
(12) Proper maintenance;
(13) Machine-tool installations;
(14) Power-plant improvements.

In fact, some individual addition may bring about big results and savings.

Non-Productive Time of Locomotives

We will now consider the design of locomotive terminals along new lines. It is surprising to see how this subject stands out at the present time. Our railroad magazines are full of articles bearing on the same in its various phases, and all pointing at the big problem—non-productive time of the locomotives.

After the engineering, mechanical, and transportation departments have decided on the location of a terminal at a particular station, then we have one factor entering into our problem. When this is decided it is necessary to locate the improvement at a particular point or place at this station, after which the number of locomotives and the various kinds to be handled are determined, as well as the schedule under which they are to operate. One of the first and most vital matters is water and drainage. It is true that topographic conditions affect our scheme. But even with this, the water and drainage matters are most vital.

You will find in studying over terminal propositions and improvements that each and every locomotive terminal is a study in itself, requiring most careful consideration to meet the requirements undwhich the same function, or work. In other words, there are no fixed standards. Consequently it is only possible in this program to analyze from a general standpoint. The A. R. E. A. Committee in handling this subject developed particular studies in order to work from a logical standpoint.

The complete locomotive terminal must be developed for future growth, possible improvement in the various units, and possible advancement in the art. Track facilities must be adequate, providing sufficient leads, switches, and cross-overs to and from service points, together with adequate leads, switches, and cross-overs to and from roundhouse and its serving units, in order to avoid delays at the coal plant, cinder plant, water plant, inspection pit, or other accessory.

From the inspection pit the roundhouse foreman is forewarned of the repairs required, if any, and will arrange accordingly. If crews are released at this point, it is the proper location for locker, wash and toilet room for crews, as well as the inspector's office.

Too much cannot be said about the cinder pit. The present locomotives of larger types will dump as high as four yards of cinders, and the cleaning will average 3 to 45 minutes; and if engines arrive in fleets there is a delay. A type of pit which we have been installing lately is the pit with cast-steel buckets and overhead traveling, or gantry crane, the crane spanning several tracks, or as many as may be required. This type of pit can be cleaned in a very short time, and the winter question of cinders freezing in cars is eliminated to a great extent. The operation, as well as maintenance, is economical. There are a great many types of cinder pits, but for a terminal I believe this type of pit with cross-over leading to a clear roundhouse track, is effective.

Coaling Station Design

The coaling station must be of modern mechanical design, constructed of suitable material, with first-class coal-handling equipment to insure long life, low maintenance, and low operating cost, preferably using electric power where practical; adequate storage capacity, with mechanical elevators, or hoists, of sufficient hourly capacity to insure ample supply in order to be assured of storage at all times and prompt release of the cars. The receiving hopper must be of ample length and width to insure the handling of a complete car and provide sufficient room for the unloading and handling of the coal. This hopper should be properly enclosed in order to protect the labor from the elements and extreme weather and at the same time increase efficiency.

The coal-storage bins should, as nearly as practicable, be self-cleaning, this being done by proper slopes of the floors and and rounding of the valleys with proper outlet fixtures, preferably of the overcut type to insure as nearly as possible a proper mixture of the coal delivered to the tender. It is also necessary to design the plant in a manner so that proper cleaning of the various bins can be accomplished. In our lignite territories we insist on cleaning of the bins semi-monthly and in the bituminous territories on cleaning of the bins monthly.

Fire protection should be provided when necessary. In the lignite territory it is undoubtedly preferable, on account of the possible firing of the coal, to construct the plant of steel or reinforced concrete; or, to consider a construction which we have found very practical, of a combination consisting of the physical or supporting structures of frame and the coal pocket or bin built of reinforced concrete plank construction.

The sand plant is designed in conformity with the requirements, and at the average large terminal should be equipped with a modern steam drier and provided with ample storage space for both green and dry sand. In some cases it is advisable to centralize and consider the drying of sand at a given terminal and ship the dry sand to the outlying districts.

The turntable must be of adequate size and capacity to handle the respective power, and, where practical, should be electrically operated. Usually one turntable serves one house, regardless of the number of locomotives housed. This is a matter that must be carefully considered in the design, depending entirely on amount of power handled. The A. R. E. A. Committee finds that in congested districts preferably 30, and not to exceed 40, stalls should be operated over one turntable; and, particularly, when four or five locomotives per stall are handled in 24 hours.

The smoke-jack proposition in a roundhouse is something that requires improvement. In some cases very successful installations have been made by the induced fan system, and in this manner the jacks are omitted and replaced with a duct system.

Floors may be of various kinds, but should be of a permanent quality such as concrete, brick, or equally good. Where the house is constructed on a large fill it possibly is best to consider a floor of the brick type. A permanent floor further facilitates the handling of locomotive parts and materials and permits of proper trucking with reduced labor.

The number of drop pits depends entirely on the purpose for which the particular house is used and the class of power handled. In ordinary cases a double drop pit for the drivers, together with drop pits for the engine truck, trailer, and tender wheels is provided. The installation of traveling crane of ample capacity around the entire circle, as well as the installation of jib cranes for cylinder work and rod handling, is essential.

A hot water washing and filling plant is a tremendous asset and necessity. It reduces the time required in blowing down, washing, and filling, and, further, conserves the water and waste steam. It also saves considerable over the cold-water system, and incidentally does away with a great deal of trouble.

The store house and its facilities should be centrally located, and preferably close to the roundhouse and shop. The walls should have an abundance of windows and the general arrangement designed in a manner to provide for the handling of the material to and from its point of distribution in an economical and practical manner, which naturally means proper roadways, platforms and racks; the racks and bins located to allow of proper aisle spaces.

The oil house, and its facilities, in a great many cases is located adjacent to the store house, and must be provided with proper facilities and installation to economically store and handle various oils, waste, grease, etc., required in the terminal. The store and oil houses, and their contents, in most cases represent large investments, and their construction to a great degree is designed from the fireproof standpoint with proper, adequate fire protection.

Problems to be Considered in Terminal Design

Problems to contend with in the details of the design and development are briefly considered herewith.

Climate and Conditions. For example, in arid sections and dry climates, timber construction in the ground for certain work can be considered, based on long life, which does not hold true in the damp climates or sections.

Elevation Above Sea Level. This point in particular enters into the problem from the standpoint of power, draught, air-compressor capacity; and the higher the elevation the greater the effect on the human elements.

Points of the Compass. In certain sections in the colder climates, we must take into consideration these facts: The facing of the inner circle of a roundhouse to the north, or to a particular direction of the wind; and this also makes it necessary to consider the kind of windows and doors to be used. This may seem odd, or sound peculiar, to some of you, but if you were to design and develop a terminal improvement at Casper, Wyo., you certainly would have to consider the wind. The facing of the building with reference to the proper light should also be considered where possible.

Character of soil is an important factor entering into the design and development.

Amount of Daylight and Darkness. The summer months give us an average of 16 hours of the 24 for daylight; this is an average over a period of 90 days. The winter months give us an average of only 10½ hours of the 24 for daylight; and this is an average over a period of 90 days of the year. This fact alone shows how vital and important it is to bring the unnatural conditions as nearly as possible to a natural condition; or, in other words, secure as much daylight, artificially, as possible.

Consider the problem on the basis of being able to operate successfully during any period of the 24-hour stage nearly alike. Too much cannot be said about this 24-hour day. When we stop to consider that a great many of the shop improvements throughout the country have been working on an 8-hour basis only, and lying idle for the remaining 16 hours, it simply indicates the possibilities; or, in other words, it means that these improvements should, when necessary, be developed and operated to their fullest extent. The 24-hour day by natural events and causes is divided into three phases of 8 hours each, known as the three 8-hour shifts. The natural shift, or the shift of preference, is the daylight shift, and commences at 7 or 8 o'clock in the morning. This is the shift we all want. It simply means, then, that we must perfect the balance of the 24-hour day as nearly as possible in order to make it nearly as acceptable as the preferred shift.

Power Plant

Power plant equipment, appliances, piping, etc., must be carefully considered, and the question of kind and quality is the vital factor in all these cases. Long life of the materials, appliances, machinery and equipment is one of the essential factors entering into a development of this character. For example, if the steam piping in a roundhouse or some other point gives out in three or four years, it means giving the matter special attention, and indicates poor selection. If there are breakdowns and failures in the machinery equipment or power it means serious delays, expense, and inefficiency; and, further, takes away from the master mechanic the very class of talent required to produce results in turning power.

Art of Locomotive Terminal Design in Its Infancy

There are a great many improvements that will be made in locomotive terminal design, and the study to improve in this art is still in its infancy and requires most constant effort. The work of the A. R. E. A. Committee in this line and other lines is one deserving of much creditable mention. I feel that there are a great many things that can be studied and taken up individually, as for instance, the development—or entire elimination—of the smoke jacks and the proper means of ventilation. The present method of smoke-jack installations and ventilation is a most wasteful method. This only in the winter months, when we try to heat our roundhouses and take the heat out through the ventilators and smoke jacks.

In our recent magazines bearing on railroad work we find many articles and designs bearing on the subject of locomotive terminals. In fact, some are a radical departure from the conventional design. I have read and studied these most carefully, and feel that some have merit, and are worthy of further careful consideration. This simply indicates that railroads, industries, manufacturers, and commercial organizations interested in railroad life are giving active and thoughtful consideration to the improvement and development of railroad work.

By adopting a certain class of combustion engines, or a certain class of pumps, that making parts interchangeable, especially at divisions isolated from central manufacturing or distributing points, has great advantages. The results obtained at a terminal are also indicated by the facilities in various installations along the line. So one has great bearing on the other. If the terminal is efficient, and the outlying points inefficient, perfect results are not obtained.

Again referring to the matter of remodeling and redesigning the older facilities, where possible, it seems to me that, inasmuch as the majority of the terminals are of the older type, the remodeling and redesigning feature is a most strong factor, as it bears and carries over the general property, and consequently brings general results instead of individual results.—Paper read before the Western Society of Engineers.

The "Evinrude" Centrifugal Pump is a New Development

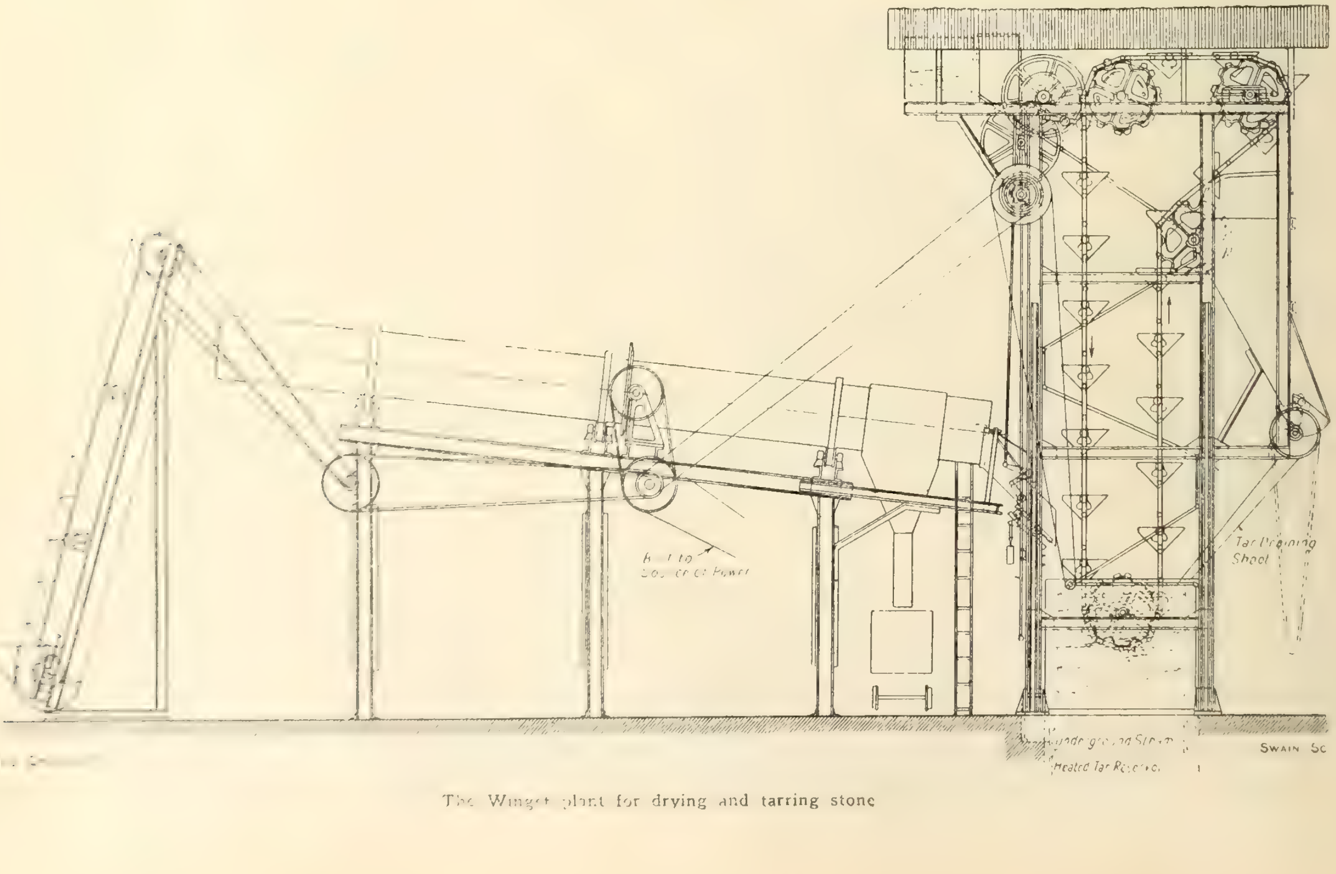
Watson, Jack & So., of 720 Power Bldg., Montreal, announce the "Evinrude" centrifugal pump with capacities from 6,000 to 9,000 gallons per hour. The Evinrude engine has made a reputation in motor boat operation for its light weight, small size and dependability and these same features are incorporated in Evinrude pumping units. Two sizes are available, operated respectively by 2 h.p. and 3½ h.p. motors. The space occupied by these units is very small; the 2 h.p. unit only requires floor space of 16½ x 23 in., and the larger unit, a space of 23 x 23 in.

Automatic Stone Drying and Tarring Plant

New Equipment, Developed in England, Has an Output of 100 Tons of Tar Macadam per Day of Eight Hours—Claimed to Give Very Effective Results

In England a new stone drying and tarring plant has just been designed and constructed. The plant is intended for an output of 100 tons of tar macadam per day of eight hours and, though it is the first of its type and has been constructed with remarkable celerity, the company, Winget Ltd., Warwick, is evidently so satisfied that it has evolved a design which will not require radical alteration, that it has not only put in its lists, but actually quoted prices for, plants of three other sizes with outputs of 20, 50 and 200 tons per day, respectively.

The apparatus is explained in "The Engineer," a representative of which saw the machine in operation. Briefly described, it has at one end a power-driven bucket conveyor which raises the broken stone and delivers it through a chute into the upper end of an inclined steel cylinder which is continuously revolved, and into the lower end of which is inserted the nozzle of an oil burner. The stone, as it traverses the cylinder, is thoroughly dried by the heat produced by the flame from the burner, and just before it is discharged it passes over a portion of the cylinder which is perforated with numerous holes, through which any dust there may be passes away, while the larger particles continue their journey. Round the perforated portion of the cylinder there is a hood with a spout depending from it, and by way of the latter the dust falls into a wheeled truck, which may be taken away and emptied at intervals. The delivery from the drying cylinder is into a chute, the lower end of which is closed and opened automatically at regular intervals. Arranged in a tower built up of rolled steel joists is an endless chain of buckets or stone containers slung on pivots between flexible steel links, and made to pass over four pairs of specially shaped sprocket wheels, the arrangement of which may be seen in the drawing. The direction taken by the row of containers nearest the drying cylinder, when the chain is put in motion, as will be presently explained, is vertically downwards, and matters are so arranged that the chain is automatically moved forward in steps, each step being of such height that container after container is in turn brought into the correct position to receive the stone discharged from the chute. The movement is timed to correspond with the opening and closing of the discharge controlling door of the chute, so that the discharge of stone is stopped before the full container is moved downwards another step, and while the container next above it is brought into position to receive its charge of stone. The charged containers are in turn passed down into and up from a tank of hot tar, and are then gradually raised until, just after passing over the first guiding sprocket, they are tripped so that their contents is discharged into a hopper of large capacity, the delivery chute of which can be opened or closed by means of a chain-operated wheel, which is worked by hand. This delaying of the discharge of the tar-macadam is for the purpose of allowing all the surplus tar which can drain away from the stone to do so, the drainings finding their way down a steel plate chute back into the tar tank.



The Winget plant for drying and tarring stone

The foregoing is, in brief outline, a description of the plant and the way it works, but it leaves a lot still to be told, for several very ingenious contrivances have been worked into the complete machine. The motive power can be of any type, but as we saw it the plant was operated by a small steam traction engine, and undoubtedly steam is the most useful medium to employ, since heat is necessary for several purposes, and some means are required for working the oil burner. The drive from the traction engine was on to a countershaft suspended from the joists on which are arranged the bearing rollers for the drying cylinder, which will be referred to later. From the countershaft just mentioned, all the motions of the plant are operated. First of all by means of two chain belts and different sized pulleys and pinions a slow speed is imparted to the conveyor which lifts the raw stone. Then by means of another chain belt, a bevel pinion and a bevel wheel, which embraces the drying cylinder, motion is given to the latter. In the drawing the bevel pinion is shown as coming at the right-hand side of the bevel wheel. As actually constructed it is on the left-hand side, and against the plain face of the wheel there is a bearing roller, the spindle of which is at right angles to the axis of the drying cylinder. From the countershaft, too, a leather belt is taken up to another countershaft near the top of the tower, and motion is thereby imparted, through spur-reduction gearing, to a further shaft—that shown uppermost in the drawing. This shaft, which revolves at quite a slow speed, performs two functions. First of all by means of a cam working in conjunction with a weighted lever, it actuates the mechanism of the chute, down which the dried stone coming from the dryer is delivered to the containers. By the combined action of the cam and weighted lever a vertically reciprocating motion is given to a rod, which, by means of a system of bell crank levers and links, performs two operations:—(a) It alternately advances and withdraws the delivery chute in such a way that first of all its end is just over the top of a container so that the stone falls directly from it into the latter, and then, when the desired quantity of stone has been delivered, pulls the chute back so as to leave a free path for the travel of the chain of containers; and (b) it raises and lowers a hinged flap or door so as in the first case to allow stone to pass down the chute, and in the second case to prevent it from doing so. It will be clear, therefore, that no stone is allowed to issue from the chute unless the latter is in such a position that all the material must fall into a container. The carriage supporting the reciprocating chute is mounted on rollers so as to reduce friction, and its action is assisted by means of counterweights and ropes.

Several Ingenious Devices

Keyed on the same shaft as the cam, and revolving in unison with it is a gear wheel, only a small portion of the periphery of which is furnished with teeth, so that only for a fraction of its revolution is it in mesh with a spur wheel, which is keyed on the shaft that carries the driving sprocket wheels of the chain of containers. By this means the containers, instead of being made to travel continuously, are moved only a step at a time, the steps being just long enough to permit of each container being brought in turn exactly into the correct position to receive stone from the chute coming from the drying cylinder. The motions of chute and containers are, of course, made to synchronise exactly, since the cam and the "hit and miss" gear wheel are on the same shaft, and no stone is allowed to fall anywhere but into the containers.

The Containers

The containers are V-shaped, and though it was impossible to see their construction, because of their being coated with tar, we were informed that they were made up of woven metal stretched on a framework, the mesh, of course, being sufficiently small to prevent the stone falling through the interstices but large enough to permit of the free circulation of the tar, as container after container is immersed in a square tank of tar arranged at the foot of the tower. The tar in the tank is kept in a fluid condition by the circulation of steam through pipes arranged in its interior. Saving at one point in their travel the containers always hang with their V point downward. As they are hauled up from the tank there is, naturally, a considerable quantity of surplus tar which drains away. So that the drawings from one container may not fall on the container immediately below it, each container is provided at its bottom with a V-shaped freely-hanging trough, which is arranged on an incline, so that the tar can flow down it, and projects sufficiently far beyond the end of the container for the tar discharged from it to fall directly into the tank and clear of the containers below it. Just after the containers in turn have passed over the sprocket wheels where their direction is changed so as to bring them immediately above the discharge hopper, they meet a tripper which tilts them through a right angle and discharges their contents into the hopper. Having passed the tripper the containers immediately return by gravity to their normal condition and hang vertically. In the hopper the tarred-stone is detained for a short period, as explained above, for all the free tar to drain away.

In the plant which we saw in operation there was an underground reservoir of tar, the top of which was at ground level, so that barrels could be readily rolled up to it and their contents discharged. This reservoir, like the tank immediately above it, was furnished with steam pipes so as to keep the tar fluid. For raising the tar from the reservoir into the tank to make up for the material used for coating the stone, there is a small pump driven by belt from the first motion countershaft at the top of the tower. As we actually saw the apparatus in operation the tower was open, but in practice it will be enclosed and, so as to keep fluid the tar in the interstices of the container screens, and also that which must find its way into the chain joints—and thus reduce friction—the interior will be kept warm by the circulation of steam through the pipes to be seen in the drawing. These pipes, we may say, were, in the plant shown at Warwick, in series with a coil of piping arranged in the interior of a tank, fixed at the top of the tower, which contained crude oil for use in the heating burner, the atomisation and propulsion through the nozzle of the burner being also effected by steam.

The cylinder in the 100-ton plant which we saw is 30 ft. long by 2 ft. 6 in. in diameter. It is built up of curved steel plate riveted together. We were informed that no lining whatever is employed, the internal temperature—though evidently quite sufficient to dry the stone which, by the way, was, in its untreated state exceedingly wet, heavy rain having fallen quite recently prior to the demonstration—not being high enough to render it necessary. A series of angles is arranged inside the tube which lift the stone and let it fall through the path of the heated gases, thus assisting in the work of drying it. The cylinder is furnished at three points with steel bearing rings, which do not bed on the cylinder itself, but are separated from it by distance blocks. These rings rest and revolve on flanged rollers which are carried by brackets attached to the steel joist framing. The flanged rollers, of course, prevent endwise movement of the cylinder.

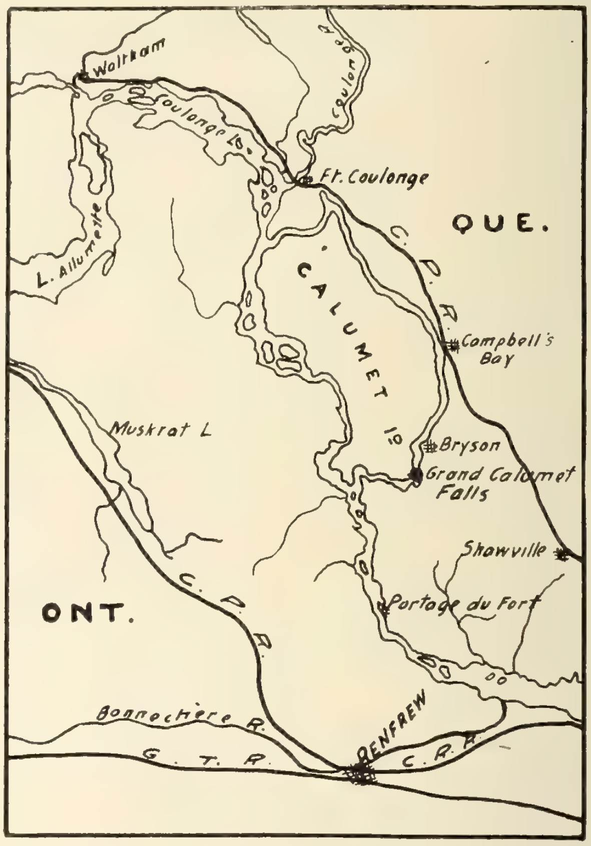
The plant as we saw it at work was operating excellently, treating first of all fine stone and afterwards larger material. Fifteen horse-power were, we were informed, required to drive it. A couple of men were employed in feeding the stone to the conveyor, while a third looked after the discharge of the finished product into a motor lorry. There was also a man in charge of the traction engine which provided the power and steam for heating, etc. As far as we saw, the burner in the drying cylinder required no attention, and only once did we observe the tar pump being looked to, and that was because its delivery was too large for the quantity of material being treated, and the tar tank became too full. The stone, which we were given to understand takes about four minutes to pass through the plant, was well tarred, and there was, so far as we observed, no dripping from the lorry of surplus tar. We were informed that the whole plant had been designed, manufactured and erected in the course of one month, and that the chief credit for it lay with the company's engineer, Mr. Lancaster.

The following claims are made of the plant. It is automatic in action, efficient and economical; it is impossible for any stone to be discharged from the cylinder without a thorough drying; the regulation of heating the stone can be effected by adjusting the length of the flame—a slight increase on the length of the flame during wet weather compensating for the increase of moisture, the output being unaffected; when a container enters the tar bath, the tar surges up through the stone, slightly buoying it up, and thoroughly saturating every particle in the container; the size of the stone in no way affects the method of treatment; the speed of the machine can be regulated should the temperature of the tar have been allowed to fall too low during manufacture; regulation of the dipping-time works in sequence with the draining-time, so that when the temperature is low and the viscosity high, the dipping-time is extended together with the draining-time, thus compensating for the increased amount of tar in the container when it leaves the surface of the bath; by raising the temperature the tar taken up by the stone can be decreased to 5 gallons per ton, and by lowering the temperature the tar content can be increased to 11 gallons per ton. By paying due attention to the temperature, 7 gallons per ton can be maintained throughout a day's work; the machine is semi-portable and easy to erect owing to the lightness of the structural details.

The Canadian Electric Railway Association will meet in the King Edward Hotel, Toronto, on June 27 to 30.

Huge Dam to be Erected on the Ottawa River at the Foot of Calumet Island

It is announced that the Ottawa & Hull Power Company is soon to begin work on the erection of a large dam at Calumet Island Falls, on the Ottawa River, near Bryson, in Pontiac County, Que. It is said that the proposed dam will measure 300 ft. in length by 85 ft. in height and it is estimated that 50,000 h.p. will be developed at one point and that 30,000 h.p. will be installed initially.



Site of the dam at Calumet Island Falls on the Ottawa river

The work on the preparation of the transmission line is already under way between Campbell's Bay and Deschenes. It is expected that the greater part of the energy will be absorbed by firms on the Quebec side, but as the Ottawa & Hull Power Co. supplies power to the Ottawa hydro-electric Power Commission, it is likely that some arrangement will be made in order that some of the new energy will be allotted to the Ottawa Commission for the Ottawa consumers. The British American Nickel Corporation's plant at Deschenes and the Canada Cement Company at Hull will be the greatest users of the power to be developed at the Calumet Falls, but, undoubtedly, the improvements will also help nearby towns, like Bryson, Campbell's Bay, etc., to induce companies to establish new industries there.

Removal of Ottawa Buildings

Messrs. J. Finn & Sons, building contractors, of Ottawa, have the contract for removing three brick residences, at present on the site of the proposed new Auditorium in that city, a distance of four blocks. All other buildings on this site have been torn down.

Coatings That Prevent End Checks When Drying Lumber

Wood dries more rapidly from the end grain than from the side grain, and is apt to check and split during seasoning unless end drying is retarded by some means. For this reason it is advisable to use a water-resistant end coating on wood during air seasoning or kiln drying, especially on woods which are difficult to dry and on short kiln samples. The Forest Products Laboratory, Madison, Wis., gives the following precautions:—

Either the cold or the hot coatings can be used effectively for drying temperatures up to 140 deg. F. Temperatures much above this cause blistering in the cold coatings but make the hot coating plastic enough to form new surfaces as fast as the old ones break. For this reason the hot coatings are apt to be more effective than cold coatings for temperatures from 140 up to 170 deg., where they liquify to such an extent that they run off. No coating has been found which is entirely satisfactory for temperatures above 170 deg. Cold coatings are perhaps somewhat better than hot coatings for temperatures above 170 deg. and for use on kiln samples when the temperatures are high enough to cause the loss of part of a hot coating.

Cold coatings to be effective should have about the consistency of heavy syrup. The amount of filler required ranges from two to four parts by weight to one of the vehicle. Cold coatings used at the Forest Products Laboratory have been found effective about in the following order, the most effective being placed first: Hardened gloss oil and air-slacked lime with the oil evaporated to the consistency of thin syrup before adding the lime (very cheap); chinawood oil and barytes (cheap); linseed oil and white lead, very heavy (moderate cost); linseed oil and red lead, very heavy (moderate cost); high-grade spar varnish and barytes (expensive).

The hot dips are effective in the following order: 213-deg. coal-tar pitch (cheap); 254-deg. coal-tar pitch (cheap); rosin and lampblack, 100 parts of rosin to 7 parts of lampblack (moderate cost).

Some asphalts are highly moisture-resistant, but they are hard to apply because of the high temperatures required to make them plastic. Paraffine has proved satisfactory as an end coating for stock during air seasoning, but cannot be used in the kiln because of its low melting-point.

Excessive shrinkage of the wood and rough handling often cause the end coatings to chip or shear off, and a fresh application of the coating must be made.

To reduce end-drying sufficiently there must be a thick coating over the entire end surface. When hot dips are used, the wood should be dipped half an inch into the liquid.

MacKinnon Steel Co. Open Sales Offices

The MacKinnon Steel Co. Limited, Sherbrooke, Que., manufacturers and erectors of structural steel and steel plate work, now have sales offices in all parts of Eastern Canada and consequently are in an excellent position to give prompt attention to enquiries.

The sales offices are as follows: General sales office, 404 New Birks Building, Montreal, Que.; R. R. Power, Royal Bank Chambers, Halifax, N.S.; Lamoureux & Kelly Limited, 285 Beaver Hall Hill, Montreal, Que.; H. G. Evans, 58 Water Street, St. John, N.B.; J. J. MacKinnon, Charlottetown, P.E.I.; A. R. Woolridge & Co., 220 King St. West, Toronto, Ont.; E. N. & W. E. Soper, 63 Sparks Street, Ottawa, Ont.; Canadian General Agencies, Reg'd., 147 Mountain Hill, Quebec, Que.

Moisture-Resistant Coatings for Wood

Shrinking and swelling and internal stresses causing warping and checking are brought about in wood by changes in the moisture content. Such changes are occurring continually when wood is exposed to changing atmospheric conditions, and the only way to prevent or retard them is to protect the wood from the air with some moisture-resistant finish or coating. In order to determine the protection against moisture afforded by various coatings, a series of tests is being conducted by the U.S. Forest Service, at the Forest Products Laboratory, Madison, Wis.

Linseed oil, although it is probably recommended more frequently than most of the other materials for moisture-proofing wood, was found in the absorption tests to be quite ineffective. Five coats of hot oil followed by two coats of floor wax failed to give any great protection.

Oil paints form a film over wood which is very durable even in exterior locations. Laboratory tests show, however, that such a film, although it may be continuous, does not prevent moisture changes in wood. Graphite paints and spar varnish are about as effective as the ordinary oil paints with the heavier pigments.

Cellulose lacquers rank somewhat higher than the foregoing in moisture-resistance. Considerable improvement can probably be effected in them by the addition of solids. They have the advantages that they are fast drying and that the films they form over the wood are very elastic.

Rubbing varnishes afford considerably more protection against moisture than do spar or long oil varnishes. The larger amounts of gum solids present in rubbing varnish probably account for their greater moisture resistance.

Enamel coatings made by the addition of pigments, such as barytes, to ordinary varnish are about as effective as rubbing varnish.

A bronze coating composed of a cheap gloss oil and aluminum powder proved in tests to be superior in moisture-resistance to any of the coatings mentioned above. This mixture is very fast drying; three coats can be applied in the course of half an hour.

The aluminum-leaf coating developed at the Forest Products Laboratory particularly for the protection of airplane propellers, is highly efficient in preventing moisture changes in wood.

Some asphalt and pitch paints are highly moisture-resistant. They are rather cheap and may be applied almost any place where their color is not objectionable. Attempts to discover a means of covering asphalt and pitch paints with lighter-colored materials have met with little success.

For temporary protection against moisture changes, vaseline smeared over varnish is one of the most moisture-resistant coatings yet tested. Another temporary protection, a heavy coat of paraffine, is about as effective as rubbing varnish.

The following table gives the results of moisture absorption tests on panels coated with the different preparations. The percentages are based on average amounts of moisture absorbed per unit surface area by coated and uncoated panels subject to a humidity of 95-100 per cent for 14 days.

Treatment	Percentage Efficiency
Aluminum-leaf process—asphalt paint base	98
Three coats spar varnish coated with vaseline	98
Three coats of asphalt paint	96
Aluminum-leaf process—spar varnish base	95
Aluminum-leaf process—cellulose lacquer base	94
Aluminum-leaf process—oil paint base	93
Three coats of aluminum bronze (quick drying)	92
A heavy coating of paraffine	91
Three coats of rubbing varnish	89
Three coats of enamel	88
Three coats of orange shellac	87
Three coats of cellulose lacquer	73
Sheet pyralin 5/1000 in. thick glued to wood	68
Three coats of graphite paint	61
Three coats of spar varnish	60
Three coats of white lead oil	54
Five coats of linseed oil applied hot and two coats of wax	38
No coating	00

Analysis of Principles Affecting Passenger Station Design

Abstract of a report submitted by the Committee on Yards and Terminals to the annual convention of the American Railway Engineering Association.

A comprehensive analysis of the principles affecting the design of passenger stations deals specially with the proper relations between the amount of business handled and the size and arrangement of the various station facilities. Conclusions presented are given below and the accompanying table indicates the relations which should exist between business handled and facilities provided in passenger stations for main-line traffic.

1. The through and loop types of stations are superior to the stub type from the standpoint of train operation.

2. The number of station and approach tracks required to handle a given traffic depends on type of station, location of coach and locomotive facilities, size of station, length of station tracks, character of traffic, design of throat and method of operation.

3. For through passenger train operation a stub terminal station will accommodate on an average two trains per track per hour, and a through terminal station between two and three trains per track per hour.

4. A ratio of from 2.5 to 3 station tracks to one throat track should be adequate if the throat is properly designed.

5. All stations should have a sufficient number of long station tracks to accommodate the longest trains.

6. Station platforms at car-floor level are superior to those at the level of top of rail, as the hazard and inconvenience resulting from the use of car steps are eliminated and the handling of passengers is expedited. However, the high platforms interfere with inspection of equipment.

7. There are many advantages in the use of separate platforms for trucking and for passengers, as station operation is facilitated and passengers are saved annoyance.

8. The requirements of through passenger and suburban service are so dissimilar that it is desirable to make a complete separation of the two classes of service.

9. Ramps are desirable where their use does not increase the distance traveled to reach a given point, and where the gradients are not in excess of 10 per cent.

10. The principal station facilities, such as information booth, ticket office, baggage check counter, parcel check room, etc., should be located in proper sequence along the line of travel and should be clearly indicated.

11. A complete separation of inbound and outbound traffic, particularly in large stations, is desirable, so that there will be no conflict between lines of travel moving in opposite directions.

12. Constructing rentable office space in connection with passenger stations offers opportunities for assisting in carrying the interest charge resulting from the construction of stations.

13. If the station building is surmounted by an office building the entrances to the latter should be independent of the station. However, consideration should be given to the possible patronage of occupants of the office building.

14. A passenger concourse is very desirable and is used effectively in many stations as an exit passage way, which permits arriving passengers to reach the street without passing through the station.

15. The required width of passenger concourse depends upon the character and amount of traffic and number of entrances and exits from the concourse.

16. A train concourse is advantageous, as it permits of serving one station platform by several train gates or conversely the serving of several platforms from one train gate. In stub stations it permits trucking from one platform to another without entering the passenger concourse.

17. A width of 20 ft. for a train concourse is adequate if it is not used extensively for trucking.

18. The waiting rooms should be located at one side of the line of travel, but near to the passenger concourse and adequately equipped with bulletin boards, clocks and other information devices so that passengers will be content to remain in the waiting room.

19. The practice of installing pay toilets is increasing. They are favorably considered where installed and are the source of a substantial revenue.

20. Ticket offices should be located adjacent to the direct line of travel, but should be so arranged that passengers waiting to secure tickets will not interfere with the general flow of traffic.

21. The parcel check rooms should be easily accessible for both inbound and outbound passengers and should have every facility for handling parcels quickly. Where the amount of business justifies, separate counters should be provided for receiving and delivering parcels.

22. The extent of cab facilities depends on the size of the city, character of taxicab service and other means of local transportation. In cities where good taxicab service is provided at a reasonable rate an ever-increasing percentage of passengers is using that service as a means of reaching and leaving the station.

23. Concessions have proved profitable in most stations and are desirable not only for producing

revenue but as a facility which adds to the comfort of the passenger.

24. The relation which should exist between business handled and the size of facilities is subject to variation due to local conditions, class of traffic, type of service rendered, outside competition, large variations in estimates of normal rush-hour business handled and the varying ideas of what constitutes adequate service.

25. The following table represents under average conditions the relations which should exist between business handled and the size of through passenger (not suburban) station facilities:

Relations Between Business Handled and Facilities Provided at Passenger Stations

Station Facility	Unit	Facility Required for Normal Number of Rush Hour Passengers Indicated								
	Passengers	250	500	750	1000	1500	2000	3000	4000	5000
Area of main waiting room	100 sq. ft.	30	53	72	89	112	128	155	178	200
Seating capacity of main waiting room	No. of seats	143	213	270	315	400	465	570	665	750
Area of women's waiting room	100 sq. ft.	5	7	9	11	14	17	23	29	35
Area of men's waiting room	100 sq. ft.	5	6	7	8	9	11	14	16	..
Total area for waiting purposes	100 sq. ft.	55	88	116	137	167	195	238	275	306
Total seats in waiting areas	No. of seats	190	300	390	470	590	700	880	1050	1200
Total area of lobby, concourse and all waiting rooms	100 sq. ft.	80	152	208	256	320	376	472	552	624
Area of men's toilet rooms	100 sq. ft.	4	6	8	10	13	15	20	26	31
Number of men's water closets	Number	6	9	12	15	19	23	29	35	41
Number of urinals	Number	5	8	10	12	15	17	20	23	25
Number of men's lavatories	Number	3	5	7	9	11	13	18	22	26
Area of women's toilet rooms	100 sq. ft.	3	4	5	6	8	10	13	16	18
Number of women's water closets	Number	7	9	12	14	17	19	23	27	30
Number of women's lavatories	Number	3	5	7	9	11	13	17	21	25
Area of ticket offices	100 sq. ft.	4	7	9	11	14	17	21	26	..
Number of ticket windows	Number	3	5	7	8	11	13	16	18	21
Number of telephone booths	Number	3	4	5	7	10	13	19	25	31
Area of telegraph facilities	Sq. ft.	100	130	150	170	210	230	280	310	330
Total area of dining and lunch rooms	100 sq. ft.	9	14	19	24	34	43	63	83	102
Total number of seats in dining and lunch rooms	Number	34	53	72	93	129	173	249	327	407
Area of kitchen	100 sq. ft.	5	8	11	14	20	26	38	50	62
Area of news stand	Sq. ft.	115	185	240	290	380	450	565	695	820
Number of barber chairs	Number	2	3	3	4	4	5	6	7	8
		Number of Pieces of Baggage Handled Daily								
	Pieces	250	500	750	1000	1500	2000	3000	4000	5000
Area of baggage room	100 sq. ft.	20	33	45	60	87	112	166	219	272
Baggage room tailboard frontage	Lin. ft.	38	62	79	95	125	150	194	230	263
		Number of Parcels Handled Daily								
	Pieces	250	500	750	1000	1500	2000	.		
Area of parcel check room	100 sq. ft.	4	6	8	10	14	18	..	.	
		Number of Pieces of Hand-Baggage Handled Daily								
	Pieces	250	500	750	1000	1500	2000	3000	..	
Area of hand-baggage facilities	100 sq. ft.	4	6	7	8	10	12	16		

Paintolized Paint

"Paintol" is the name of a chemical compound with which the Paintol Chemical Co. Ltd., of Quebec City, are experiencing considerable success. It is mixed with paint and functions as a preservative agent in protecting the surfaces of timber, lumber, metal, glass, plaster and stone. It is claimed that not only does it thus enhance the quality of the paint, but that it doubles surface area and actually cuts down the cost of the work very materially. The manufacturer illustrates the economy obtainable by citing the cost of a gallon of prepared paint at anywhere from $2.50 to $7.50 a gallon, and showing how by the addition of a gallon of "Paintol" at a cost of one dollar, two gallons of paintolized paint costing from $3.50 to $8.50 can be obtained—thus effecting a saving of from $1.50 to $6.50 a gallon of paint. Among those who have used "Paintol" under exacting conditions and reported favorably upon it are the Davie Shipbuilding & Repairing Co. Ltd., of Levis, P. Q., and the Department of Marine & Fisheries.

It is of interest to record that Mr. O. H. Cote, well-known until quite recently as industrial Commissioner for the City of Quebec, is manager of the Paintol Chemical Co. Ltd., with offices at 111, Mountain Hill, Quebec City.

Quebec's Road Estimates

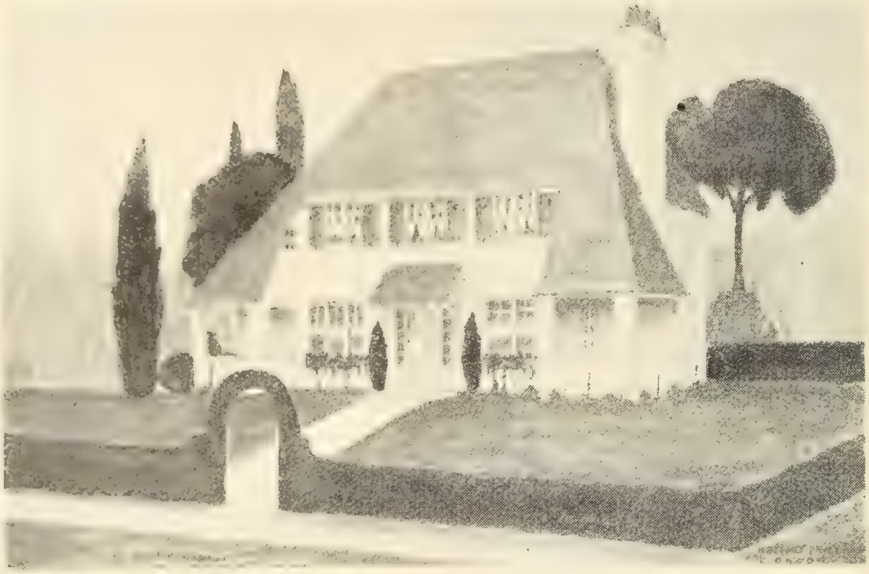
Compared to a total of nearly $11,000,000 spent last year on new roads, repairing, re-surfacing and maintenance, the Province of Quebec's road estimates, submitted to the cabinet on April 25, only reach a little over $5,000,000. Out of this amount $500,000 will be used for new roads, while $1,500,000 will go to complete sections of roads already started. Maintenance, in accordance with the legislation adopted at the last session of the Legislature, will get a share of $2,000,000, which will practically be an annual expenditure. Resurfacing alone will figure for an amount of $1,000,000.

Quinze River Power Site to be Developed

The lease of the Ka-Ka-Ka Falls, Quinze River mentioned in our last issue as being offered at auction on April 25, has been awarded to W. A. Fasken, Toronto. Mr. Fasken is connected with the Northern Ontario Light & Power Company, who already have large interests in the mining district. The available power is about 90,000 h.p. and the price paid by Mr. Fasken is $80,000 per annum rental. We understand the development will be undertaken at once.

The Contract Record's

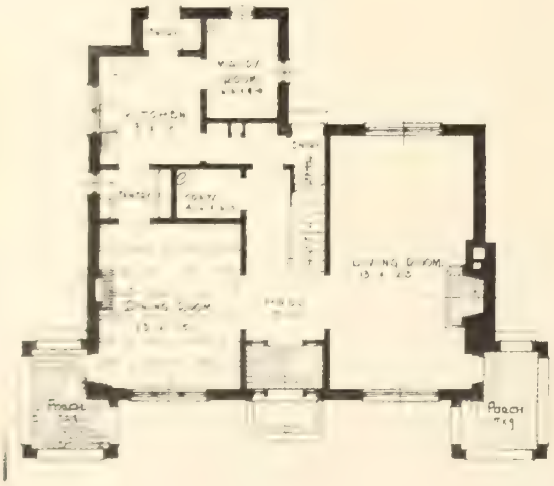
Weekly House Suggestion No. 66

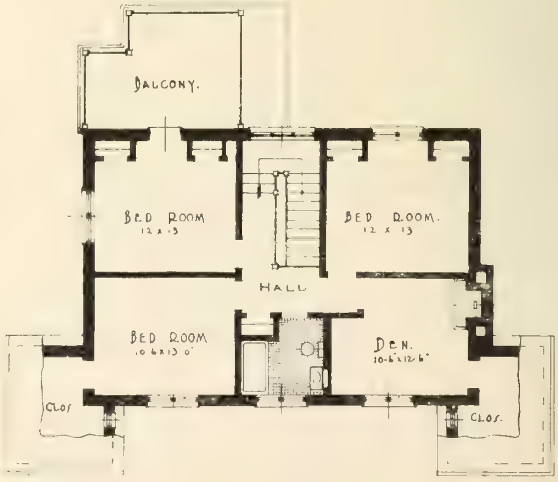


The handsome stucco residence shown in the accompanying sketch is to be erected for Lt.-Col. Francis B. Ware, at the corner of Wellington and Victoria streets, London, Ont., and will cost about $12,000. The walls will be of Natco 8 in. hollow tile construction, stuccoed with Bishopric white. The roof will be laid with three shades of brown stained shingles, varying exposures, and its odd design plays an important part in the general distinctiveness of appearance. The shutters and flower boxes will be stained a French green, completing a very pleasing color scheme. The two side porches, opening on the living room and dining room respectively, are laid with tile, as is the vestibule at the front entrance.

The layout of rooms on each floor, as seen in accompanying plans, is simple and convenient. The dining room has a beamed ceiling and gas fireplace and the living room and den are also equipped with fireplaces. The flooring throughout will be of oak, with the exception of the bathroom, where white tile will be used. The heating system will be of the hot water type.

Walter Stuart Pavey, of 380 Richmond St., London, is the designer of this very attractive stucco home.





Mainly Constructional

East and West—From Coast to Coast

On the site of the old Forum building, at the southeast corner of Gerrard and Yonge streets, Toronto, the Canada Life Assurance Company intend shortly to erect a palatial new structure to cost something over $300,000 which will be known as the new Forum building.

Hamilton's beach road, cutting off from the Toronto-Hamilton Highway at Burlington and forming a connecting link between that road and the Hamilton-Niagara trunk highway, has been added to the Provincial highways system and will be taken over this spring by the Department of Highways, according to a recent announcement.

As an indirect result of the epidemic of typhoid at Cochrane, Ont., the town of North Bay has been pre-emptorily ordered by the Provincial Board of Health to install a chlorinating plant for its water supply. A number of other municipalities, equally far removed from the epidemic, are said to have received similar orders.

A recent report states that a 14-storey office building is projected for construction at the corner of King and York streets, Toronto, on the present site of the Imperial Hotel. The report goes on to say that plans for the structure have been completed by the builders of the new Federal Building, the General Building Corporation, and the estimated cost is about $1,000,000.

Negotiations are now under way between the Canadian National Railways and Dorchester Realties, Ltd., of Montreal, for the purchase of the Shaughnessy Building owned by the latter, to provide additional office accommodation for the C. N. R. The building is situated at 137 McGill St., is ten storeys high providing 70,000 ft. of office space and the price asked is said to be $800,000.

Messrs. Pigott & Healy, contractors of Hamilton, have the contract for the foundation, brick and cement work on the new plant for the Hamilton By-Products Coke Ovens., at that city. The approximate cost of the buildings and equipment for this plant is $2,000,000. Construction is already under way and it is anticipated that the plant will be in operation by November 1 next.

At a recent meeting of the business men of Todmorden, one of Toronto's suburbs, the pressing need for a sewage system for the village was the main subject of discussion. The meeting decided to present a request to the York Township council for the installation of a sewage system and suggested the appointment of Mr. R. O. Wynne-Roberts, of Toronto, as consulting engineer.

It was estimated by the town council of Riverside, Ont., recently that $150,000 will be spent this year on the general sewage scheme for Riverside, to cost, when completed, about $325,000. The expenditure this year will cover cost of the construction of the sewage disposal plant, the purchase of the site for the plant, the construction of the big trunk sewer on Ottawa street from the westerly limits of Riverside to the sewage disposal plant site, and the construction of on intercourse sewer along Riverside drive from Ford boulevard east to Intersection road, thence south to Ottawa street trunk sewer.

Sir Henry Thornton speaking at a meeting held at the city hall in Ottawa recently, expressed his approval of the removing of C.N.R. cross-town tracks in that city and instructed the Company's engineer of construction, Mr. Stanley Gzowski, to confer with a competent engineer whom the city might appoint for the purpose of drawing up a plan for the ultimate removal of all cross-town tracks. He suggests that the C.P.R. be approached in this connection also.

By-laws providing for the issue of debentures to cover the cost of school construction in three sections were passed by the council of York Township, Ont., a few days ago. One by-law authorizes the issue of $80,000 debentures for the building of four-room extensions to the J. R. Wilcox and Memorial Schools in S. S. No. 16, Fairbank. A sum of $100,000 will be needed to build an eight-room addition to Silverthorne School, S. S. No. 35 and furnish it with the necessary equipment. Danforth Park School, S. S. No. 26, will be completed at an additional cost of $10,000.

On the occasion of the annual discussion of arrangements for the Labor Day celebration at Toronto exhibition, one of the suggested novel features advanced by Mr. John Sutherland, spokesman for a delegation from the Trades and Labor Council, was the building of a small home in the record time of 35 minutes. This proposal was made to Managing Director John G. Kent and Chairman Robert Fleming of the Attractions Committee, and in outlining the proposal, Mr. Suaherland stated there would be 35 men engaged on the work, the house to be of frame construction with plaster walls and stucco on part of the exterior. The proposal was looked on favorably by the officials.

Personal

Mr. Herman Winters, of Chatham, Ont., a former treasurer of Dover township, has been appointed gravel inspector for the provincial government. The appointment is the outcome of an agitation which municipalities in this section of Ontario joined in, with the determination of securing better service from the gravel companes. Many public works in this section of the province were delayed last year owing to difficulty in securing adequate supplies of gravel. The duties of the new official will be to see that the municipalities secure gravel of the quality and in the quantities called for in orders, and that such are delivered on time.

W. Nelson Smith, M. E. consulting electrical engineer of the Winnipeg Electric Railway company and Dr. John W. Shipley, professor of chemistry of the University of Manitoba, have recently been awarded the Plummer Medal for 1921-22 by the Engineering Institute of Canada for their two research papers entitled "The Self Corrosion of Cast Iron and Other Metals in Alkaline Soils," and "The Corrosion of Buried Lead Pipes".

Obituary

Mr. Donald C. Barton, former general manager of the Canadian Electric Light Company, of Levis, and consulting engineer of the Quebec railway, Light, Heat and Power Company, died in Quebec city recently. Mr. Barton was born in India and educated in England, coming to this country in 1900. After a stay of five years in Montreal, he accepted an appointment as general manager of the Canadian Electric Light Company, at Levis, at the same time becoming consulting engineer of the Quebec Railway. When the Levis Company was absorbed by the Quebec Railway Co., he remained with the latter company in the capacity of consulting engineer.

Trade Incorporations

La Compagnie de Brique et Beton, Ltee., with head office at Amos, P. Q., capital $49,900, to manufacture brick and other building materials.

York Mills Builders' Supplies Co. Ltd., with head office at Toronto, capital $40,000, to deal in builders' supplies, specializing in concrete blocks

CONSTRUCTIONAL ACTIVITY

Period of April 25 to May 1, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Blissfield, N. B.

Tenders for a concrete arch culvert and road embankment at Mollasses Hill Bridge in Northumberland County, are being received by the Provincial Department of Public Works, Fredericton, until May 8.

Elora, Ont.

Alternative tenders on pavements costing $55,000 for Woolich, Victoria, Metcalfe and Geddes Sts., are being received by Harry Clarke, Town Clerk, until May 7. One proposal calls for concrete while the other calls for asphalt on a concrete base.

Islington, Ont.

The Etobicoke Township Council is receiving tenders on supplying 9,700 feet of cast iron pipe; 6,500 lbs. of cast iron specials; 14 hydrants; 19 valves and boxes; laying 9,700 feet of mains, until May 5. N. McNichol, engineer, Islington.

Inwood, Ont.

Road improvements costing $30,000, including new roads and maintenance, are contemplated by Brock Township Council. W. J. Weed, Inwood, clerk.

Lachine, Que.

Sidewalks and sewers on 53rd. St., are contemplated this summer by the Town Council. E. Leduc, secretary.

Merriton, Ont.

Richard Clark, Town Clerk, is receiving tenders for the construction of approximately 3,500 sq. yds. of concrete pavement, until May 4. F. N. Rutherford, 24 Queen St., St. Catharines, engineer.

Milton, Ont.

Chipman & Power, 272 Bay St., Toronto, are preparing plans for a sewage system for the town. G. A. Hemstreet, Milton West, clerk.

Montreal, Que.

Tenders will, be called shortly by the City for sewers on Dundurand and Rouen Sts. S. Fortin, engineer.

St. Ambroise de la Jeune Lorette, Que.

The Town Council contemplate a bituminous road, 1 3/4 miles long, 16 feet wide. Work will be done by day labor under the supervision of Chas. Boute. J. O. Savard, secretary.

St. Basile, Que.

Jos. Durand, Clerk, is receiving tenders for the Town Council for the oiling of three miles of bituminous roads.

Sandwich, Ont.

W. P. Coyle, County Clerk, Sandwich, is receiving tenders until May 8 for the construction of about three miles of concrete roadway in Essex County for the Windsor Suburban Commission.

Seaforth, Ont.

Tenders for laying approximately 3 1/4 miles of 6" and 8" watermains are being received by John Wilson, Town Clerk, for the Town Council. James, Proctor & Redfern Ltd., 35 Toronto St., Toronto, engineers.

CONTRACTS AWARDED

Fernie, B. C.

Fred J. Dawson, Nelson, B. C., has been awarded the general contract for waterworks, laying sewers and providing pipe and branches, for the city.

North York Twp., Ont.

Contracts awarded by the Township Council for the installation of a new waterworks system are: Dam, pumphouse, filtration plant, R. Campbell & Co., $39,230; pumping machinery, Bawden Machinery Co., $12,117; filtration equipment, International Filtration Co., $12,050; elevated steel tank, Morton Steel Co., $16,300; cast iron pipe, National Iron & Piep Co., $19,000; tank foundations, Rocco & Co., $2,065; laying if mains, Rocco & Co. and Rusicco & Co., $4,426.

St. George, N. B.

Stephen Construction Co., Prince William St., St. John, have been awarded the general contract for an extension to sewers for the town costing $36,000.

York County, Ont.

Toronto & York Roads Commission, 57 Adelaide St. E., Toronto, have awarded the following contracts for roadwork for the County costing $400,000: Concrete base with asphalt top, curb and gutters at Agincourt and concrete base with asphalt top Brown's Road, Standard Construction Co., Mimico Beach, Ont.; concrete base with penetration top, curb and gutters at Schomberg, Curran & Briggs, Orillia, Ont.; concrete base with asphalt top, Scarlett Road, Construction & Paving Co., Confederation Life Bldg., Toronto, Ont.; Concrete base with Warrenite Top, York Road and concrete base with Warrenite top, Sutton Road, Warren Bituminous Paving Co. of Ontario Ltd., Toronto, Ont.; Concrete base with penetration top, Kennedy Road, A. E. Jupp Construction Co., 170 Berkley St., Toronto, Ont.; concrete base with penetration top, Vaughan Road, Roy Honsberger, Vineland, Ont.; concrete base with penetration top, Don Mills Road, Law Construction Co. Ltd., 107 Hillsdale Ave., Toronto, Ont.; waterbound macadam, Sutton Road and Blantyre Diversion, Orr & Clark, The Oaks, Toronto, Ont.; waterbound mecadam, Weston Road, E. S. Dagg, Kleinburg, Ont.

Railroads, Bridges and Wharves

Arthur, Ont.

The Provincial Department of Public Highways is preparing plans for a cement arch bridge, at George St., costing $45,000. This work will be done during the summer.

Chatham, Ont.

George McCubbin, engineer, is receiving tenders on "Gibb" bridge, on the boundary between Moore Twp., and the Sarnia Indian Reserve, until May 5. This bridge will be skew beam span, reinforced concrete abutments with roadway 28 feet wide.

Tenders are being received by the Dominion Government for the renewal of 182 ft. of the revetment wall, at McGregor's Creek at a cost of $16,000. R. C. Desrochers, Dept. Public Works, Ottawa, is receiving the tenders until May 16.

Ford City, Ont.

Sir Adam Beck, Chairman of the Hydro-electric Power Commission, is receiving tenders until May 5 for the construction of a single track street railway on Sandwich St., from the east limits of Walkerville to Strabane Ave.

Montreal, Que.

Plans are being prepared by the C.N.R. for a branch line from Watrous to Manitou Lake, Sask., a distance of 4½ miles. A. E. Warren, general manager.

North Bay, Ont.

T. & N. O. Railway, North Bay, contemplate a branch line from Swastika to Larder Lake, a distance of 25 miles. At least two bridges will be required and cost of work is estimated at $35,000 a mile. George Lee, North Bay, Commissioner.

Rondeau, Ont.

The Dominion Government will call for tenders for repairs to piers costing about $10,000. R. C. Desrochers, Department of Public Works, Ottawa, secretary.

St. Joachim, Que.

Tenders on a steel bridge for the Town Council will be received by Mayor Reid until May 7. I. E. Vallee, Departmen of Public Works, Quebec, engineer.

Sandwich, Ont.

Hydro Electric Power Commission, 190 University Ave., Toronto, is receiving tenders for double tracking the street railway on London St., from Bridge St. to Soper St., until May 5. Mr. Gaby, Chief Engineer

Tingwick, Que.

A concrete and steel bridge, 28 feet long and 15 feet wide in Chenier Twp., is contemplated by the Town Council. F. V. Lessard, Tingwick, secretary.

Walkerville, Ont.
The Hydro Electric Power Commission of Ontario, 190 University Ave., Toronto, is receiving tenders until May 5 for the construction of a single street railway track on Sandwich St., from the Grand Trunk Railway bridge to the east limits of Walkerville, Mr. Gaby, Chief Engineer.

Separate tenders on a 50 ft reinforced concrete girder bridge, one mile south of Ripley, and concrete abutments and floor for a 90 ft. bridge and steel superstructure for the same, four miles east of Paisley, will be received until May 8 by G. E. Stephenson, engineer, Walkerville, for Bruce County Council.

Windsor, Ont.
Tenders for the construction of street railway tracks on Erie St. from Ouellette Ave. to Parent Ave.; Parent Ave. from Erie St. to Ottawa St.; Ottawa St. from Parent Ave. to Lincoln Rd.; Ouellette Ave. near Maple Ave. a siding approximately 475 feet long are being received by the Hydro-electric Power Commission of Ontario, Toronto, until May 5. Mr. Gaby, Chief Engineer.

Public Buildings, Churches and Schools

Acton Vale, Que.
Tenders for alterations to the church, costing $15,000, are being received by this Parish. Rev. J. A. Bonin, curate, has plans and specifications.

Tenders for alterations to the convent, estimated to cost $25,000, are being received by the Superior of the Convent for the Soeurs de la Presentation. No closing date has been set.

Blairmore, Sask.
Plans have been prepared for an addition to a building for School Section No. 28, Blairmore. The building, which will cost $14,000, will be of stucco construction on a concrete foundation. Burrell & Basevi, Calgary, architects.

Brooklin, Ont.
S. S. No. 3 Whitby Township, is having plans for a two storey brick school containing six rooms prepared by J. T. Hornsby, Lindsay, Ont. Structure will cost $30,000. W. S. Croxall, Brooklin, secretary.

Chapleau, Ont.
Gordon & Helliwell, Confederation Life Bldg., Toronto, will prepare plans for a Nurses' Home, for the Hospital Board, two storeys and basement, stone foundation, brick construction.

Cooksville, Ont.
A one storey school costing $16,000 is contemplated by the school board. A. E. Tomlin, secretary. The architect has not yet been appointed.

Embro, Ont.
R. A. Duncan, Embro, Will secure plans and estimates for a Masonic Building.

Montreal, Que.
The Catholic School Commission has mapped out a building program calling for thirty schools costing $4,000,000 to be built in various sections of this city. A. Lafontaine, 87 St. Catherines St., secretary-treasurer of the Commission, which plans to erect these buildings during 1923 and 1924.

North Bay, Ont.
Tenders for a two storey, six room, addition to North Bay Collegiate of stone, brick and structural steel construction will be received until May 12. Miss M. Bailey, secretary. Angus & Angus, Angus Block, architects.

Oshawa, Ont.
J. A. McGibbon, secretary of the Board of Education, is receiving bulk tenders on a Public School, two storeys, sixteen rooms, brick, stone and structural steel construction, until May 9. Separate tenders are being received on plumbing, heating and wiring.

Quebec, Que.
Pierre Levesque, 115 St. John St. is preparing plans for a brick church costing $40,000 for the Roman Catholic congregation of Kedgewick, N. B.

Regina, Sask.
Storey & Van Egmond, architects, will call for tenders shortly for a $30,000 Free Hebrew School. This building will be a two storey fireproof structure and will be erected at the corner of Halifax St. and Thirteenth Ave.

St. Boniface, Man.
A by-law authorizing the raising of $240,000 for the building of a new school was carried by the ratepayers recently.

St. Thomas, Ont.
Darrach & Findlay, 430 Talbot St., are receiving tenders until May 12, for wrecking two brick buildings on the site chosen for the addition to the General Hospital.

St. Joseph D'Yamaska, Que.
S. R. Richer, 240 Girouard St., St. Hyacinthe, is preparing plans for a school costing $25,000 containing four class rooms and a basement. H. St. Germain, chairman of the School Board.

Scotstown, Que.
E. Beaudoin, secretary of the School Board, is receiving tenders on a two storey school, 40 ft. x 40 ft., stone foundation, brick, costing $8,000.

Strathroy, Ont.
By-law authorizing the expenditure of $25,000 for an addition to the hospital was passed and tenders will likely be called in May. W. G. Murray, Dominion Savings Bldg., London, architect.

Toronto, Ont.
Tenders will be called early in May by the Toronto Public Library Board, 226 College St., for a $35,000 branch at the corner of Ashdale Ave. and Gerrard St. Building designed by Shepard & Calvin, Excelsior Life Bldg., will be of brick, 36 ft. x 80 ft.

Jas. N. Boulter, 307 Grace St., is preparing plans for a brick Sunday School costing $230,000 for Rogers Presbyterian Church. Frank Westwater, 29 East Lynn Ave., chairman of Building Commitee.

Sproatt & Rolph, architects, are preparing plans for two residences and a school building for St. Andrew's College to be built on North Yonge St. at a cost of $400,000. Rev. Dr. MacDonald, interested.

Permission has been granted by the Harbor Board for the Kew Beach Ladies' War Canoe Club to erect a Clubhouse at the foot of Woodbine Ave. Five hundred dollars has already been raised towards the building fund. Miss Reta O'Halloran, interested.

Sisters of St. Joseph Community, St. Alban's St., have purchased a site on Victoria St. for an addition to St. Michael's Hospital. Particulars concerning the building and date on which construction will start is not yet decided.

Walkerville, Ont.
Plans will be prepared for a $40,000 edifice for the Anglican Church. Rev. A. E. Duplan, rector.

Westboro, Ont.
Plans are being prepared for a Masonic Temple and tenders will be called shortly by the Westboro Masonic Temple. Fred Haney, interested. Building will be two storeys high, solid brick and steel construction..

CONTRACTS AWARDED

Campbellford, Ont.
The Board of Education has awarded the general contract for the new High School to T. A. Brown, Toronto.

Kingston, Ont.
Contracts awarded on the $300,000 library for Queen's University are as follows: Roofing, J. D. Sanderson, Ottawa; electrical, Harry Alexander Ltd., Toronto; plumbing and heating, McKelvy & Burch, Kingston; plastering, J. Nelson & Son, Toronto; tile, National Fireproofing Co. of Canada, Toronto.

Lansing, Ont.
Roderick Campbell, 18 Toronto St., Toronto, has the general contract and will let all sub-trades for a $50,000 school for S.S. No. 4, North York Twp. This building will be two storeys high, 91 ft. x 38 ft., hollow tile, stone and brick construction. Ellis, Ellis & Richardson, Manning Chambers, Toronto, were the architects.

London, Ont.
L. B. Kerr, 196 Simcoe St., has the general contract for a $40,000 Sunday school and gymnasium for Knox Church. Building will be of white brick, 45 ft. x 70 ft., two storeys and basement.

Montreal, Que.
Crushed stone for the Police Courts, costing $3,000,000, is being supplied by Montreal Quarry Ltd., 800 Bellechasse Street.

The contracts for roofing and asphalt flooring for the Pathological Building at McGill University have been awarded to G. W. Reed & Co., 37 St. Antoine St. Faustin Ltd., 662 Beaudry St., has the contract for ornamental iron.

Welland, Ont.
The contract for mastic flooring for the Public Library has been awarded to

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Toronto Electric Commissioners' Tenders

Sealed tenders addressed to the Chairman of the Toronto Electric Commissioners will be received until 12 o'clock noon, Thursday, May 10th, [illegible]

[illegible] marked cheque

Form of tender and specifications may be obtained from the Purchasing Agent, Duncan Street Station.

The lowest or any tender not necessarily accepted.

TORONTO ELECTRIC COMMISSIONERS.

18

Tenders Wanted

Collegiate Institute, North Bay, Ont.

Sealed tenders addressed to Miss Margaret Bailey, Secretary, Collegiate Institute, North Bay, will be received up to 12 o'clock noon

Saturday, May 12,

for the erection and completion of a six room addition to Collegiate Institute, North Bay, Ont.

Plans and specifications may be seen at the office of the undersigned.

The successful tenderer will be required to furnish guarantee bond.

The lowest or any tender not necessarily accepted.

ANGUS & ANGUS,
Registered Architects,
Angus Block, North Bay, Ont.

18-19

TENDERS

Construction of Water Works

TOWN OF HANOVER

Separate or combined tenders for the supply of GATE VALVES, RELIEF VALVES, VALVE BOXES, FIRE HYDRANTS, CENTRIFUGAL PUMPS, MOTORS, GASOLINE ENGINES, BRASS SCREENS, CHLORINATOR, ETC., and for the construction of PUMP HOUSE, CONCRETE RESERVOIR, LAYING WATER MAINS, EXCAVATION, AND TEAMING are [illegible] by the [illegible] Town of Hanover up to 2.00 P.M. on

Thursday, May 10th, 1923,

Detail information may be obtained from the Consulting Engineers.

Plans and specifications may be seen at the office of the Engineers or the Town Clerk.

JOHN TAYLOR, Esq.,
Town Clerk,
Hanover, Ont.

F. W. THOROLD CO. LIMITED,
Consulting Engineers,
54 Admiral Road,
TORONTO.

17-18

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

TOWN OF MERRITTON

Tenders for Pavement

Sealed tenders, marked "Tender for Pavement" and addressed to Richard Clark, Town Clerk, Merritton, will be received until 6 o'clock p.m. on

Friday, May 4th, 1923,

for the construction of approximately 3500 square yards of Concrete Pavement.

Full information may be obtained from the Engineer.

No tenders necessarily accepted.

F. N. RUTHERFORD,
Town Engineer,
24 Queen St., St. Catharines, Ont. 17-18

Town of Campbellton, N. B.

Tenders for Pavement

Sealed tenders plainly marked as to contents will be received by the undersigned until

7th of May, 1923.

for the construction of, Hot Mixed Paving 36,000 sq. yards.

Plans, specifications and form of tender may be seen at the office of the Engineer.

The lowest or any tender not necessarily accepted.

R. J. SANDOVER SLY,
Town Engineer.

Town Engineer's Office,
Campbellton, N.B. April 11th, 1923. 16-18

Township of Pickering

County of Ontario

Sealed tenders marked as to contents, will be received by the undersigned until noon of Thursday, **May the 10th, A.D. 1923**, for the removing of the West Concrete Abutment of the Larkin Bridge, and rebuilding of same, situated on the Base-line opposite lot 13 Tp. of Pickering.

The work must start immediately and be finished as soon as possible.

Plans and specifications may be seen and all other information obtained from the undersigned.

A marked cheque for 5% of the amount of the tender must accompany each tender.

The lowest or any tender not necessarily accepted.

JOHN FORGIE, Reeve,
Claremont, Ont.

D. J. KEAN, Engineer,
Whitby, Ont.

18

Tenders Wanted

Sealed tenders will be received by the undersigned up until twelve o'clock noon

Saturday, May 12th,

for the erection of a THREE STOREY FIRE PROOF MEMORIAL HOSPITAL for the city of St. Thomas, Ontario. Tenders separate or in bulk.

Plans, forms of tender and all particulars can be obtained at the office of the undersigned. Plans can also be seen at MacLean's Building Reports Limited, Toronto.

The lowest or any tender not necessarily accepted.

DARRACH & FINDLAY,
Architects,
Room 4, 430 Talbot St.,
ST. THOMAS, ONT.

17-18

COUNTY OF ESSEX

Suburban Roads

Sealed tenders marked "Tender for Concrete Road" and addressed to W. P. Coyle, County Clerk, Sandwich, Ont., will be received until 1 o'clock, P.M. on

Tuesday the 8th day of May, 1923,

for the construction of approximately three miles of concrete road.

A marked cheque for $2,000.00 must accompany each tender.

Plans, specifications and form of tender may be obtained from W. P. Coyle, County Clerk, J. J. Newman, Engineer in charge, Windsor, Ont., or John F. Millen, Sec. Windsor Suburban Area.

No tender necessarily accepted.

JOHN F. MILLEN,
Sec. Windsor Suburban Commission,
Sandwich, Ont. 17-18

Temiskaming and Northern Ontario Railway Commission

Tenders Wanted

Sealed tenders addressed to W. H. Maund, Secretary-Treasurer, The Temiskaming and Northern Ontario Railway Commission, North Bay, Ontario, will be received until ten a.m. of Friday the eleventh day of May, for the erection of a

Brick Station

at Haileybury, Ontario.

Plans, specifications and form of tender, may be obtained at the office of the Chief Engineer, North Bay.

An accepted cheque on a chartered bank of Canada equal to five per cent of the tendered price, must accompany each tender.

The lowest or any tender will not necessarily be accepted.

S. B. CLEMENT,
Chief Engineer,
North Bay, Ont.

April 24th., 1923. 18

SEALED TENDERS

Marked "Tender for Hospital Extension" will be received by me at my office until 12 o'clock noon of

Wednesday, May 9th, 1923,

for the construction of an Extension to the Cornwall General Hospital.

Contractors are requested to name a lump sum price for the building complete including certain work in the present building and the installation of a central heating plant, also a price for the building complete not including heating plant or work in the present building.

Drawings and specifications may be examined at the office of W. H. Magwood, C.E., Cornwall.

A cash deposit or accepted cheque equal to 10% of the tendered price must accompany each tender.

The Board of Governors reserves the right to accept the lowest or any tender and to reject any or all tenders.

J. C. ALGUIRE,
Sec'y Treas.

Cornwall, Ont. April 24th, 1923. 18

CITY OF BRANTFORD

Tenders for the Sale of Two Bridge Spans

Sealed tenders addressed to Ald. C. S. Moyer, Chairman Board of Works, Brantford, in care of City Clerk will be received until 5 o'clock P.M.

Thursday, May 17th, 1923,

for the sale of two wrought iron and steel truss bridge spans crossing the Grand River in the City of Brantford.

Particulars may be obtained from the City Engineer.

FRANK P. ADAMS,
City Engineer.

Brantford, Ont. April 27th, 1923. 18

City of St. Lambert, Que.

Tenders Invited

Tenders will be received up to 5 P.M., May 7th, 1923 for the following:-

850 feet of 24 inch Sewer.
4761 " 18 "
1534 " 15 "
4886 " 12 "
2289 " 9 "
37 " Manholes.
88 " Street Gullies.

NINETY THREE THOUSAND (93,000) lineal feet of Concrete Sidewalk 4 feet 6 inches wide with gutter.

Plans may be seen. Specifications and Form of Tender may be had at the office of the undersigned.

The City reserves the right to reject any or all tenders.

(Sgd.) E. DRINKWATER,
City Engineer.

City Hall, St. Lambert. 18

TENDERS

For Concrete Bridges

Sealed tenders will be received up to 4 00 o'clock, standard time,

Wednesday, May 16th, 1923,

for the undermentioned works:-

(a) A reinforced concrete bridge of three suspended arches, 40 ft., 84 ft., and 40 ft., South of Oxbow.
(b) A reinforced concrete bridge of three spans, 60 ft. suspended arch in centre and 20 ft., beam span at each end; south of Carlyle.
(c) A 30 ft., reinforced concrete beam span, near Hawthorne.
(d) A reinforced concrete bridge of three spans, 60 ft., suspended arch in centre, and 20 ft., beam span at each end. South-west of Moosomin.

The contracts will be let separately for the individual works.

Tenders on these works may be mailed under one cover, but tenders for each separate work must be accompanied by an accepted cheque or other satisfactory deposit for the amount of $250.00. Deposits of unsuccessful tenderers will be returned when the contracts are awarded.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister, Department of Highways.

Plans, specifications, forms of tender and all information may be obtained on application to the undersigned.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways,
Government of Saskatchewan.

Regina, Saskatchewan, April 23, 1923. 18

SEALED TENDERS

Marked "Tenders for O'Brian Drain" will be received by us at our office in the Town of Vankleek Hill until two o'clock in the afternoon of

Saturday the 12th day of May, 1923

for the completion of the work of constructing the Main Outlet of the O'Brian Drain in the Township of Caledonia near Caledonia Springs Station. A considerable portion of the excavation consists of peat, which has caved in and there are also large masses of peat, which have become detached from the main body of peat along the sides of the drain which will be required to be removed. The whole work is to be completed on or before the 15th day of October, A.D. 1923

A cash deposit or accepted cheque on a chartered bank equal to 5% of the tendered price must accompany each tender.

The lowest or any tender not necessarily accepted.

The estimated quantities of excavation for a completed drain having a bottom width of 5 ft. and with side slopes of ½ horizontal to 1 vertical is 15,540 cu. yds. This does not include a large portion of the masses of peat, which have become detached.

Contractors are requested to tender a lump sum price for the construction of a finished drain of the form above described.

Forms of tender may be procured and specifications examined at our office, at the office of The Township Clerk, St. Amour, Ont., or at the office of W. H. Magwood, Civil Engineer, Cornwall, Ont.

Dated at Vankleek Hill, Ont.,
This 14th day of April A.D. 1923
HALL & HALL,
Solicitors for Tp. of Caledonia 19

SEALED TENDERS

Marked "Tender for Paving" will be received by me at my office until 12 o'clock noon of

Monday May 14th, 1923,

for the work of paving Second Street between Marlborough and Cumberland Streets in the Township of Cornwall. Type of construction Bituminous Concrete on Concrete Base.

1442	cubic yards excavation and back fill.
37	catch water basins complete.
4300	cubic yards excavation to sub grade.
10100	lineal feet concrete curb.
10700	lineal feet steel curb.
44500	lineal feet ½" reinforcing bars.
18260	square yards pavement.

Length of work 5237 feet.

Plans and specifications may be examined and forms of tender procured at the office of W. H. Magwood, Town Engineer.

A cash deposit, accepted cheque or Guarantee Company's bond for a sum equal to 10% of the tender price must accompany each tender.

The Municipal Council reserves the right to accept the lowest or any tender and to reject any or all tenders.

J. G. HARKNESS,
Town Clerk.

Cornwall, Ont.. Aril 25th, 1923. 18-19

Hydro-Electric Power Commission of Ontario

Tenders for Track Construction

Border Cities

Sealed tenders addressed to the undersigned and endorsed "Tender for Track Construction" will be received at this office until 12 o'clock noon

May 5th, 1923,

for the construction of a Single Track Street Railway in Walkerville on Sandwich Street, from Grand Trunk Railway Bridge to East Limits of Walkerville; also a single track street railway in Ford City on Sandwich Street from East Limits of Walkerville to Strabane Avenue.

For the construction of a double track street railway in Windsor on Erie Street from Ouellette Avenue to Parent Avenue; on Parent Avenue from Erie Street to Ottawa Street; on Ottawa Street, from Parent Avenue to Lincoln Road.

For the construction of a double track street railway in Windsor, on Ouellette Avenue, near Maple Avenue, a passing siding, approximate distance 475 feet.

For the construction of a double track street railway in Sandwich on London Street from Bridge Street to Soper Street.

Plans, specifications and form of contract may be seen at the office of the Superintendent of the Hydro-Electric Railway, Windsor, and at the office of the Railway Engineer, Toronto.

The lowest or any tender will not necessarily be accepted.

COLONEL SIR ADAM BECK, Kt., Chairman,
Hydro-Electric Power Commission of Ontario,
190 University Ave., Toronto, Ont.

Toronto, Aril 24th, 1923. 18

FOR SALE

Keystone Excavating Machine, complete with two sticks, skimmer scoop, and three ditching scoops; this machine has been used only one season and is guaranteed to be in first class condition. Price $4,500 f.o.b. St. John, N. B.

Austin Backfiller with caterpillar traction, 4-cylinder Buffalo engine, in equally good condition. Price $2,500 f.o.b. St. John, N. B. Canada Lock Joint Pipe Limited, 65 Pleasant Boulevard, Toronto, Ont.; or St. John, N. B. 6-T.f.

Tenders for Bridges and Grading

COUNTY OF PEEL

[illegible] to the under- [illegible]

Thursday, May 10th, 1923,

[illegible]

3 Reinforced Concrete Beam Bridges.
1 Reinforced Slab Top Bridge.
3500 cubic yards of grading on the Dixie-Burnhamthorpe Road.

[illegible] seen on and [illegible] May 7th, at the court house, [illegible]

The lowest or any tender not necessarily accepted.

N. L. POWELL,
County Road Superintendent
Brampton
18

TOWNSHIP OF NORTH YORK

Tenders Wanted

Sealed tenders addressed to H. D. Goode, Clerk, Lansing, marked "Tender for Municipal Build- [illegible] until

Saturday, May 12th, 12 o'clock noon,

for the construction of Municipal Building at [illegible]

Plans and specifications may be seen at the Clerk's office, Lansing, or at the office of the architect, Murray Brown, 324 Confederation Life Bldg., Toronto.

Tenders must be accompanied by an accepted cheque for 5% or a Guarantee Company or Builder's Bond.

The lowest or any tender not necessarily accepted.

H. D. GOODE,
Clerk.
18

Toronto Transportation Commission

TENDERS

Sealed tenders will be received for the construction of the new Roncesvalles Car House, Roncesvalles Avenue and Queen Street West, consisting of a Reinforced Concrete Car House and a Brick Office Building and including all plumbing, heating, electric wiring, rolling steel doors, automatic sprinklers and all other work necessary for the completion of the buildings.

All tenders are to be endorsed "Tender for Roncesvalles Car House" and are to be addressed to the Chairman of the Toronto Transportation Commission, and are to cover all the work contemplated and must be delivered at the offices of the Commission, 35 Yonge St. not later than [illegible]

Friday, May 18th, 1923.

Each tender must be on the Commission's form of tender and must be accompanied by an accepted bank cheque payable to the Toronto Transportation Commission for two and one-half (2½) per cent of the amount of the tender.

Plans and specifications, form of tender, and instructions to bidders may be obtained upon application to the Commission's Buildings Dept. third floor, 35 Yonge St., on and after May 3rd, [illegible]

The lowest or any tender not necessarily accepted.

H. H. COUZENS, General Manager,
Toronto Transportation Commission.
18

ESTIMATOR—Open for engagement; Scotch [illegible] Box 245, Contract Record, Toronto. 18-21

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 22, Section D, subsection (a)" will be received by the undersigned until twelve o'clock noon on

Wednesday, May 23rd, 1923,

for the excavation of approximately 35,000 cubic yards of earth and other work required in the construction of Provincial Highway from Neudorf east to the north-east corner of Section 12, township 20, range 7, West of the 2nd Meridian.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:-

W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.; Geo. E. Vanderburgh, Sec-Treas. R.M. No. 185, Neudorf, Sask.

An accepted cheque for the sum of $1,000.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of 4 p.m. Wednesday, May 23rd, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways, Regina, Sask.
May 2nd, 1923. 18

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 14, Section H, subsection (a)" will be received by the undersigned until twelve o'clock noon on

Wednesday, May 23rd, 1923,

for the excavation of approximately 26,000 cubic yards of earth and other work required in the construction of Provincial Highway from Dafoe north-west to the north-east corner of Section 12, township 33, range 19, West of the 2nd Meridian.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:-

W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.; J. P. Crelley, Sec-Treasurer, Village of Dafoe, Sask.

An accepted cheque for the sum of $700.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of 4 p.m. Wednesday, May 23rd, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways, Regina, Sask.
May 2nd, 1923. 18

TOWN OF COBOURG

Tender for Paving

Sealed tenders plainly marked as to contents will be received by Mr. A. W. Young, Clerk, Cobourg, Ontario, until noon,

Monday, May 14th,

for the construction of a Pavement, Concrete Base and Bituminous Top, on William Street and George Street, Cobourg, approximately 14,000 sq. yds.

Plans, specifications and forms of tender may be seen at the office of the Engineers, James, Proctor & Redfern, Limited, 36 Toronto Street, Toronto.

The lowest or any tender not necessarily accepted.

Col. F. D. BOGGS,
Mayor.
A. W. YOUNG,
Clerk.
18

COUNTY OF OXFORD

Tenders for Bridges

Sealed tenders will be received by the undersigned up to 2 P.M. of

Saturday, May 12th,

for the construction of:

(a) **78 ft. steel truss bridge.**
(b) **42 ft. steel girder bridge.**
(c) **30 ft. concrete beam culvert.**
(d) **14 ft. concrete slab culvert.**
(e) **Concrete floor on existing steel bridge.**

Plans and specifications at the office of the undersigned.

The lowest or any tender not necessarily accepted.

F. J. URE & SON,
County Engineer,
Woodstock, Ontario.
18

Tenders Wanted

BOARD OF EDUCATION

Sealed tenders, addressed to the Business Administrator and Secretary-Treasurer, Board of Education, Administration Building, 155 College St., endorsed with the word "Tender" and also with the name of the school building and trade or article to which it relates, will be received until

Tuesday, May 8th, 1923,

for

(1) **Masonry, Structural Steel, Carpentry, Plastering, Wiring, Phones, Plumbing, Heating, Ventilation and Heat Regulation for CLINTON STREET SCHOOL.**
(2) **Fixtures (Carpenter Work) for HARBORD COLLEGIATE.**
(3) **Plastering for HUMBERSIDE COLLEGIATE.**
(4) **Terrazzo Flooring for GLEDHILL SCHOOL.**

Specifications and conditions of tendering may be seen and all information obtained at the office of the Architect of the Board, 155 College St., Telephone Trinity 8200.

Tenders must be in the office of the Secretarial Department at the Administration Building, 155 College St., not later than 4 P.M. on the day named, after which no tender will be received.

The lowest or any tender will not necessarily be accepted.

W. W. PEARSE.
Business Administrator and Secretary-Treasurer.
F. E. POWELL,
Chairman Property Committee.
18

QUANTITY SURVEYOR—Fully qualified in all classes of work wants position. Box 246, Contract Record, Toronto. 18-21

TOWNSHIP OF SCARBORO

Tenders Wanted

Sealed tenders, plainly marked as to contents, will be received by the undersigned at his office, Bank of Commerce Building, Birchcliffe, Stop 19, Kingston Road, Toronto, until 12 o'clock, noon,

Monday, May 14th, 1923,

for the construction of concrete sidewalks together with the necessary grading on the following streets: (Bidder may tender on any or all of the contracts, but a separate tender must be made for each contract.)

Contract No. 1—Byng Ave., Ellward Blvd., Mansion Ave., Kenworthy Ave., Leyton Ave., Madeline Ave., Robinson Ave.

Contract No. 2—Woodrow Blvd., Preston St., and Maxwell Ave.

Contract No. 3—Cornell Ave., Queensbury Ave., Haig Ave., Lakeside Ave., Ballahula Blvd., Eastwood Ave. and Kingston Road.

Plans, profiles and specifications may be seen and forms of tenders obtained at the office of the engineer, 1361 Kingston Road, Toronto.

All bids must be on the blank form supplied by the Township and must be acompanied by a certified cheque or bid bond for 5% of the tender price.

The lowest or any tender not necessarily accepted.

C. G. FRASER, Engineer.
W. D. ANNIS, Clerk.
May 1st, 1923. 18

Equipment for Sale

Complete equipment for rock quarrying and macadam road construction. Apply Box No. 217, Contract Record, Toronto. 15-T.f.

STEEL PILING

Bought and Sold

Universal Equipment Company
Niagara Falls. 11-T-f.

To Rent

Steam Road Roller, First Class Shape. The T. Sidney Kirby Co. Limited, 213 Sussex St., Ottawa. 16-T.f.

FOR SALE

No. 6 Gates Gyratory Crusher Type K with extra parts and in good running condition. Also 12 H.P. heavy duty gasoline engine. Both for immediate sale. Apply R. H. Miner Company, Ltd., 207 St. James Street, Montreal. 15-18

WANTED

In Montreal and Toronto reliable representative for a splendid line of building specialties. Must be in constant touch with architects in his locality. Box 234, Contract Record, Toronto. 17 18

FOR SALE

Fire Proof Vault Doors

We have for immediate delivery 49 vault doors, clear opening 36" x 78" built special for 17" wall, instead of 20" wall which is our standard. We will dispose of all or part of these doors at a very reasonable price in order to sell them at once.

DOMINION SAFE & VAULT CO. LTD.,
18-20 Niagara Falls, Ont.

For Sale

1—T. Cooke Sons, Engineers R.R. Transit, with tripod, almost new, $225.00.
1—Gurley 22" Y. Level with tripod, $120.00.
3—14 ft. rods, at $10.00 each.
M. L. Williams, 29a Belmont St., Montreal. 17 18

Stone Crushing

Man wanted with complete equipment to undertake crushing and screening of approximately 18,000 yards stone. Apply Box 229, Contract Record, Toronto. 18

Some One Wants to Buy

The equipment or machinery that you are not using.

It may be occupying valuable space in your yard or shop, collecting dust, rust and hard knocks.

Sell it before "Depreciation" scraps it.

Use the Tender & For Sale Department. It helps others, let it help you.

FOR SALE

Sturtevant Heating Unit

Fan 9',8" diameter

Steam Coils steel encased 8' 6" wide x 7' 8" high x 8' 6" long. Inlet for Ehaust Steam 10" dia. Also Inlet for Live Steam 1½' dia.

The above was used for heating our Bridge Shop which was destroyed by fire, and we accordingly offer it for sale.

PRICE; $1500.00 f.o.b. Cars, New Glasgow.

THIS IS A REAL BARGAIN.

The Maritime Bridge Co , Ltd.
NEW GLASGOW, N.S 18

For Sale

New and Second Hand Rock Crushers, Steam and Gasoline Rollers, Portable Steam Engines, Dump Wagons, Ttc.

Also

Repairs for Crushers, etc.

J. B. DORE & FILS,
18-21 Laprairie, P. Que.

ARCHITECTURAL DRAUGHTSMAN WANTED capable of designing and overseeing steam and hot water installations for schools, churches and business buildings, also familiar with structural steel, reinforced concrete and general architectural work. Good position for right man. Only strictly temperate man need apply. Give references. Samples of work and wages required, also places held last three years. F. Neil Brodie, Architect, 42 Princess Street, St. John, N.B. 16-18

CONTRACTOR'S SUPERINTENDENT, just disengaged, requires position, life-long experience, well up in all classes construction, quantities and estimating, excellent references. Box 224, Contract Record, Toronto. 18

GENERAL CONSTRUCTION SUPERINTENDENT wants job. Thoroughly practical with twenty years experience. Last job Quarter of a Million. A1 references. Go anywhere. Box 231, Contract Record, Toronto. 17-20

WANTED position as foreman or superintendent on construction work, on sewers, tunnels, watermains, pavements, sidewalks, macadam roads. A1. I have recommendation if needed. All kinds of construction work. Box 193, Walkerville P.O., Ontario. 18-21

Propose to Extend Tramways

Permission to increase tramway fares from 12 centavos to 15 centavos (from 4½ to 5½ cents, at exchange rate of March 2) has been asked of the Intendente of Buenos Aires by the Anglo-Argentine Tramways Co. and the Lacroze Tramway Co. In return for the increase the former company has offered to undertake the construction of the proposed underground railway between Avellaneda and Retiro, where the principal railway offices of the Afgentine Central, the Cordoba Central, and the Buenos Aires Pacific Railways are located. The Lacroze Co. agrees to construct 15 miles of lines in various parts of the city. Furthermore, in case the increased tariffs should be sanctioned, the two companies are to grant a 20 per cent increase in wages of employees receiving up to 250 pesos, paper ($92.16, at exchange of March 2), per month.

There is some opposition to the increase in fares, but it is realized that higher operating costs must be considered. The proposed extensions are believed essential to the traffic needs of the city.

Railway Mileage Increases

The Spanish railway mileage in 1922 was increased 130 kilometers, and there are now 250 kilometers of new road under construction. Moreover, plans are being made for the double-tracking of 1,000 kilometers. The rapidity with which the plans are carried out depends on the ability of Spanish industry to manufacture rails. At the present time the potential production of steel rails by Spanish companies is 40,000 tons per year, which it is estimated would double-track 222 kilometers with 45-kilo dails. The extension of many lines is being restricted by the Government policy of protecting national industry, which prevents giving contracts for rails to foreign companies.

May Slow up Building

Governmental building and construction work now under way should be slowed down and the initiation of new projects delayed, Secretary Hoover recommended to President Harding in a letter made public. He advises that they may be pushed forward at some later period, when there is less private construction activity and more need for alleviating or preventing unemployment.

The Commerce Secretary, in a report made at the President's request, suggested that State and Municipal Governments consider the adoption of a similar policy.

The Vulcan Asphalt & Supply Co., [illegible] Bloor St. West, Toronto.

Business Buildings and Industrial Plants

Alvinston, Ont.
Plans are being prepared for a flax mill for McColl & Co., costing $15,000. [illegible] tenders in May.

Bowmanville, Ont.
The National Hotel Co., will make alterations to its building costing $12,000. Lumber, plumbing, hardwood flooring, etc., have not yet been purchased.

Brantford, Ont.
The Industrial Realty Co., propose to build a factory, two storeys, 40 ft. x 160 ft., of reinforced concrete construction, with provision for a future addition of two storeys. This building will be occupied by the Brandon Shoe Co.

Cooksville, Ont.
W. J. Turner & Sons, are excavating for a garage costing $8,000. Building will be 100 ft. x 40 ft., concrete block construction on a concrete foundation. Materials have not yet been purchased.

Frederiction, N. B.
The Canadian Pacific Railway contemplates a station here. J. M. Woodman, Divisional Superintendent.

Huntsville, Ont.
Muskoka Wood Mfg. Co. Ltd., R. J. Hutcheson, manager, contemplate a boiler house. This building will be built of concrete and brick, one storey high, 40 ft. x 40 ft. Fireproof roofing and structural steel not been purchased yet.

London, Ont.
The Starr Phonograph Co., 190 Dundas St., has purchased buildings and proposes to remodel it into a factory and show rooms.

Louisville, Que.
W. Lawler, Louisville, contemplates an $10,000 hotel, brick on concrete foundation, 30 ft. x 40 ft. Domestic telephones to be purchased.

Materials have notyet been purchased for an $8,000 store, two storeys, brick on concrete foundation, 36 ft. x 30 ft. All sub-trades will be let.

R. L. Gregory, Acton, has appointed Hall & Duerr, Lumsden Bldg., Toronto, architects for a theatre contemplated at a cost of $18,000, to be erected here.

Sorel, Que.
Arthur Demarais, manager of the Balmoral Hotel, is receiving tenders on sub-trades and prices on materials for a three storey hotel, steel and brick construction, costing $75,000. This building was designed by E. A. Doucet, 195 St. Catherine St., Montreal, and will be 78 ft. x 63 ft.

Toronto, Ont.
W. L. Sommerville, architect, 45 Bloor St. east, Toronto, is receiving tenders on a rooming house at Kapuskasing, Ont., containing fifty rooms.

A $300,000 building, three storeys high, at the corner of Yonge and Gerrard Sts., designed for show-rooms and offices is contemplated by the Canada Life insurance Co.

London Life Insurance Co., London, propose to erect a seven-storey office building costing $250,000. A site on Bloor St., west of Yonge St., 52 ft. x 180 ft., has been purchased and building is to be commenced shortly. Dowswell & Dolphin, 58 Wellington St. west, architects, have prepared the plans.

Vancouver, B. C.
To provide accommodation for motor tourists the C. P. R. will build a $20,000 summer camp including a large Community Hall, cedar logs, and six bungalows. F. W. Alexander, Divisional Engineer, Vancouver, architect. F. W. Peters, Superintendent of Pacific Division.

Vermillion, Alta.
United Grain Grower's Ltd., Bank of Hamilton Bldg., Winnipeg, contemplate an $11,000 grain elevator of frame construction.

CONTRACTS AWARDED

Fort William, Ont.
Feagles Construction Co. Ltd., has started work on a $600,000 addition to an elevator owned by Western Terminal elevator Co., Winnipeg. One reinforced concrete work-shop and thirty eight reinforced concrete tanks, 90 feet high and 20 feet in diameter, are included in this work. The owners buy all material.

London, Ont.
H. J. Jones & Sons, Dundas St. E., are having plans prepared for a lithographing plant costing $100,000. The contract for clearing the site and rebuilding the plant has been awarded to Jones Bros., Hamilton Road.

Jones & Spry, 38½ Glebe St., have the general contract for two stores and four apartments, red pressed brick construction, three storeys, 40 ft. x 50 ft. G. A. Brickenden, London Loan Bldg., owner.

Montreal, Que.
A. F. Byers, & Co., 340 University St., general contractor, is excavating for a $50,000 storage and warehouse for Fryon & Fryon, 288 Garnier St. Phoenix Bridge Co., 83 Colborne St., have the steel contract and the Metal Shingle and Siding Co., 91½ Delorimer St., the roofing contract.

The contract for steel for stores, flats and a garage for I. J. Feldman, 663 St., Lawrence Blvd., has been awarded to the Dominion Bridge Co., Lachine. Structure will be three storeys, 25 ft. x 70 ft. and one storey, 25 ft. x 23 ft. Owner buys all material and will let sub-trades.

Bremner Norris & Co. Ltd., 65 McGill St., have been awarded the general contract for the $15,000 storage building for the Colgate Company. This structure will Co. Ltd., Ryrie Bldg. Ccontract for steel awarded to the Phoenix Bridge & Iron Works, 83 Colborne St. Contracts for sprinkler system, electrical work, plumbing, etc., will be called later.

Toronto, Ont.
A factory costing $125,000, one storey and basement, 58 x 250 ft., reinforced concrete construction, will be built by W. J. Trimble, 54 University Ave., for Bradshaw Ltd., 107 Atlantic Ave.

The general contract for a $750,000 addition to the Robert Simpson Co's store has been awarded the Jackson-Lewis Ltd., Ryrie Bldg. The contract for steel has been awarded to McGregor & McIntyre, Shaw St. The new building will be eight storeys, 50 ft. x 210 ft., steel and brick construction. Passenger elevators and escalators will be installed.

Ideal Bread Co., 183 Dovercourt Rd., will make an addition to their bakery costing $40,000. Structure will be two storeys 60 ft. x 100 ft. R. Chalkey & Son Ltd., 258 Avenue Rd.. have the masonry contract; R. G. Kirby, 539 Yonge St., has the carpentry contract and Harris & Marson, 81a Parkway Ave., the electrical contract.

Sement-Solvay Co., Syracuse, N. Y., have awarded the Canadian Allis-Chalmers. Ltd., Bridge Department the contract for structural steel, about 800 tons, for their new Coke Oven Plant at Hamilton. Wirk will commence at once.

W. J. Pickard Ltd., 365 Church St., have awarded the general contract for a storage warehouse costing $50,000 to John G. Kent & Sons, general contractors, Confederation Life Bldg. This building will consist of 6 storeys and a basement, 55 ft. x 75 ft., concrete construction faced with brick.

Vancouver, B. C.
Dominion Construction Co., 509 Richards St., has the general contract for the superstructure for a $430,000 grain elevator for E. A. Woodword Co. Ltd., Winnipeg, Man.

Winnipeg, Man.
A. J. Bonnett Bros., Confederation Life Bldg., Winnipeg, have the general contract for an $8,500 garage one storey, 50 ft. x 50 ft., brick construction on concrete foundation, Contracts for plumbing and heating will be let by Oldfield, Kirby & Gardiner, 234 Portage Ave., Winnipeg.

Residences

Cooksville, Ont.
Plans are being prepared for Capt. John Slater, 30 Harbord St., Toronto, for a two storey brick dwelling, 38 ft. x 48 ft., stone and brick construction. No material yet purchased.

Hamilton, Ont.
Ellis & Atkinson, Sun Life Bldg., will build a brick residence two storeys high, costing $15,000.

London, Ont.
Dr. J. Karn 556 Waterloo St., contemplates a $10,000 residence and is having plans prepared.

Moncton, N. B.
A two storey frame residence, 30 ft. x 34 ft., concrete foundation contemplated by E. Legere, c/o T. & A. Legere, St. George St.

A $20,000 residence, three storeys, concrete and brick construction, is contemplated by Moncton Construction Co., c/o A. A. Townes, Weldon St. Material has not yet been purchased.

Montreal, Que.
John Dominique, 5044 Sherbrooke St. W,. is excavating for an apartment house, 4 storeys, 60 x 90, solid brick on a concrete foundation. Contracts for steel. roofing, electrical work, plumbing, heating, plastering, brickwork ets., have not yet been let.

J. M. Lessard, 285 Maplewood Ave..

is excavating for three flats costing $24,000. Sub-trades are not yet let. Building will be of frame and cottage brick construction three storeys high.

Tenders on 17 residences are being received by Barott & Blackader, architects, Canada Cement Bldg.

Four residences costing $25,000 will be built by A. Prevost. 1010 Cote des Neiges Rd.

Four residences costing $32,000 contemplated by H. Langton, 670 Gilford St. Owner will let sub-trades.

Normandin, Que.

The Roman Catholic Parish contemplates a $20,000 manse, 30 ft. x 30 ft., brick and concrete construction. The architect has not yet been appointed.

Ottawa, Ont.

Tenders for an apartment house costing $50,000 are wanted by McCarthy & Wakley, architects, Westboro, until April 28.

Plans for a large apartment house are being prepared for Alderman Fred Desjardins, Charlotte St., by Noffke, Morin & Sylvester, Central Chambers.

J. E. Janesse, 384 Maclaren St., who will build a $6,000 residence requires 8,000 brick and materials for 30 cu. yds. of concrete and 700 sq. yds. of plaster.

Point Grey, B. C.

W. W. Bailey, 1825 Broadway, west, Vancouver, will build a two storey residence, 30 ft. x 42 ft., concrete foundation, frame and stucco construction, costing $16,000.

Quebec, Que.

J. S. Royer, 128 St. Cyille St., will build a residence costing $19,500.

Sandwich, Ont.

L. D. Galloway, 357 Windermere Rd., Walkerville, is excavating for a $10,000 frame dwelling, one storey, 24 ft. x 32 ft., concrete block foundation, hot water heating. Builder has not purchased material yet.

Frank Guardot, 414 Peter St., is excavating for a two storey residence, 50 ft. x 34 ft., concrete block foundation. Contracts for roofing, plumbing, heating and electrical work are not yet let.

Sarnia, Ont.

Thomas Grace, 650 Christina St. south, has the general contract for a $15,000 residence for C. H. Belton, 312 London Street.

Saskatoon, Sask.

A frame dwelling, 2 storeys, concrete foundation, will be built by S. H. Bruce, 630 Strathcona St., Winnipeg.

Shawinigan Falls, Que.

Residence costing $6,000 contemplated by Alfred Blais, Levis St.

Sudbury, Ont.

The Presbyterian Church wants tenders on a manse costing $9,000. W. J. Bell, Chairman of Board of Managers.

Toronto, Ont.

Charles Temple, 398 Palmerston Blvd., has purchased a site on Summer Drive, near Armour Heights, and contemplates a residence costing $25,000.

Tenders for electrical work, plumbing and heating for a $12,000 residence are being received by M. S. Chisholme, 2866 Dundas St. West.

J. Thistlewaite, 42 Thornhill Ave., is receiving tenders for electrical work, plastering, plumbing and heating for a two storey residence costing $10,000. Lumber, brick, and furnace have not yet been purchased.

G. H. Blyth, 566 Beresford Ave., has not yet secured lumber, brick, roofing furnace or plumbing for a $12,000 duplex residence, two storeys, brick and stone construction.

Plans are drawn and tenders are wanted by Frank Spence, 29 Christie St., on all trades for a two storey dwelling, 24 ft. x 36 ft., stucco and brick construction, stone foundation. No material as yet purchased.

H. H. Tennison, 145 Galt Ave., architect and general contractor, is building a two storey brick and stucco residence and garage costing $10,000.

W. L. Summerville, 45 Bloor St., east, Toronto, is receiving tenders on fifty residences, frame construction, to be erected at Kapuskasing, Ont.

Two apartment houses containing fifteen five roomed suites costing $100,000 each will be built on Bloor St. opposite High Park. N. G. Beggs, 6 Jean St., architect.

Harry J. Long, Glendonwynne Ave., has not yet let plumbing, heating and electrical contracts for a $10,000 duplex residence, Willard Ave., near Colbeck Street.

Tenders for plastering, electrical work, plumbing and heating for a $12,000 residence will be received by A. R. Burk & Co., 18 Toronto St.

Tenders on all mechanical trades for a residence costing $20,000 are being received by A. R. Burk, 18 Toronto St.

Harry J. Long, 76 Glendonwynne Ave., has the founations in for two residences costing $10,000 each. Contracts for heating, plumbing and electrical work are not yet let.

T. W. Robinson, 11 Evelyn Cres., has the foundations in for a residence costing $8,000, two storeys, 22 ft. x 44 ft., brick and stone construction.

Godson Home Builders' Co., 172 Colbeck St., are receiving tenders for drains, concrete work, plastering, electrical work, plumbing and heating for a duplex residence to be built in Rosedale. The structure will be brick, two storeys on a concrete foundation.

Mathers & Haldenby, Manning Chambers, will call for tenders on a two storey brick and stone residence costing $45,000 to be built at the corner of Maple & King George Blvd.

Jas. Crang, 3 Robina Ave., is excavating for 2 residences costing $7,500 each and will let several sub-trades.

R. D. Davidson, builder, 184 Arlington Ave., is excavating for a residence costing $7,500.

Frank Britton, 108 High Park Gdns., will shortly commence work on a brick apartment house containing 14 suites and costing $50,000.

Henry C. Lefroy, 34 Dundurn Ave., has the foundations in for a residence costing $12,000. Sub-trades to be let.

Mr. Chester B. Hamilton, c/o Craig & Madill, 707 Yonge St., is building a residence in Rosedale costing $12,000. Tenders on all trades are being received by the architect.

Tenders on all trades for a $9,000 residence are being received by Craig & Madill, architects, 707 Yonge St.

Two storey brick residence costing $10,000 is being built by Blackburn & Adair, 1041 Davenport Rd.

Residences costing $28,000 are being built by Henry Taylor, 48 Gillespie Ave. Sub-trades to be let.

Eight residences planned by R. Luxton, 583 Pape Ave. Tenders are being received on all trades.

Gingras Bros., Cowan Ave., have the foundations in for residences costing $7,000 and want prices on sub-trades.

Tenders are wanted by Wm. Bryerton, 225 Wychwood Ave., on all trades for a duplex residence.

J. H. Snider, 211 Arlington Ave., is excavating for a residence costing $7,500.

$12,000 residence will be built by R. W. Frow, 1129 College St. Sub-trades to be let.

Truro, N. S.

Frank McCurdy, Truro, will build a dwelling for F. C. Layton, costing $8,000.

A $9,000 rectory planned by the congregation of the Anglican Church. G. W. Pollock, interested.

Walkerville, Ont.

Dwelling and garage costing $7,000 is being built by J. F. MacDonald, 710 Victoria Ave. Sub-trades to be let.

Weston, Ont.

C. H. Smillie, 162 John St., has the general contract for a residence costing $8,500 for A. Smith, Weston, and also the general contract for a residence in North Toronto for H. N. Westwood, costing $8,000.

Windsor, Ont.

L. B. Gallaway, 357 Windermere Rd., is excavating for a duplex residence costing $8,000.

Winnipeg, Man.

Andrews & Sons, 284 Victor St., will build a residence costing $8,000 for E. Craig, c/o general contractors.

Yorkton, Sask.

A two storey residence of frame and stucco construction costing $5,000 is contemplated by W. M. Graham, Yorkton. Tenders are being received by the owner. Storey & Van Egmond, Regina, architects.

CONTRACTS AWARDED

Montreal, Que.

J. H. A. Bohemier, 99 St. James St., will have a $9,000 residence built by C. Trotter, 3066 Henri Julien St. Sub-trades will probably be let.

Point Grey, B. C.

Thomas McClay, 3036-7th Ave. W., has the general contract for a two storey 30 x 60 frame residence for R. G. Buchanan, 744 Hastings St. W. Building will cost about $14 500.

Saskatoon, Sask.

Fred Shoquist, 520-9th St., will build a one storey frame dwelling costing $7,000 for F. J. Searls, 629-7th St.

Work will start almost immediately or an apartment block for Saskatoon Drin-

[illegible] costing $[illegible]. The general contractor is [illegible].

Souris, P. E. I.

McNally & McQuaid [illegible] have the general contract for a parochial house for Rev. [illegible] McLean costing $15,000. [illegible] & Hunter, [illegible] Bldg., architects.

Toronto, Ont.

A two storey [illegible] dwelling costing $15,000 will be built for Neville Morine by E. H. Yeigh, 45 Bloor St. E.

Westmount, Que.

C. J. Brown, Ltd., 4263 St. Catherine St. west., will build a residence costing $22,000 for J. H. Scott, 578 Roslyn Ave. This dwelling will be two storeys, 30 ft. x 60 ft., of brick with a concrete foundation. General contractor is buying material. Contract for roofing, electrical work, plumbing, heating and brickwork [illegible].

Winnipeg, Man.

Northwestern Construction Co., 166 Donald St., will build a $14,000 residence for Dr. P. H. McCully, 97 Academy Rd., Winnipeg. Materials have not yet been purchased for this building which will be two storeys, 34 ft. x 44 ft. brick and stucco, concrete foundation.

Power Plants Electricity and Telephones

Glace Bay, N. S.

Electrical extensions and improvements to the plant contemplated by the Town Council will cost $36,000. L. [illegible] engineer.

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[illegible]

Port Hope, Ont.

Bell Telephone Co., 76 Adelaide St., Toronto, have purchased a site for an exchange to be built this summer.

CONTRACTS AWARDED

Elko, B. C.

Winston Bros., Elko, have commenced work on a $250,000 hydro-electric plant for the East Kootenay Power Co., Elko, B. C. This contract included the construction of a power dam on the Kootenay River and boring a tunnell 2,000 feet long, 12 ft. x 14 ft., mostly through solid rock.

Miscellaneous

Fredericton, N. B.

J. Raymond Burpee, Richard B. Hanson and Charles Dougherty have been granted letters patent and will operate as Burpee Construction Co., Ltd., capital $99,000. Head office, Tinker, Victoria County.

Moncton, N. B.

Tenders for an oil distributing plant, 20 x 40, concrete pier foundation, iron clad construction, costing $50,000 will be called shortly by Canadian Oil Co. Ltd., Barrack Point, St. John. H. V. Lounsburg, manager.

Montreal, Que.

Geo. A. Fuller Co. Ltd., contractors, 285 Beaver Hall Hill, have moved to 10 Cathcart St.

Latourelle, architect, has moved from 103 St. Francois Xaxier St., to 43 Place D'Armes Hill.

Quotations on sand, stone, cement, brick, lumber and also excavation for the construction of a reinforced concrete warehouse for Gowan's Kent Co. Ltd., Toronto, are wanted by E. G. M. Capè & Co., 920 Birks Bldg., Montreal.

Ottawa, Ont.

R. C. Desrochers, Department of Public Works, Ottawa, is receiving tenders on dredging at the following points in the Province of Quebec Until May 11; Nicolet, Riviere St. Charles, Riviere de Loup and St. Pierre les Becquets.

Tenders for dredging at Midland, Bowmanville, Penetanguishene, Port Hope, Sault Ste. Marie and Point Traverse, all in the Province of Ontario are being received by R. C. Desrochers, Department of Public Works, Ottawa, until May 11.

Sarnia, Ont

Sarnia Curling Club, recently organized with a capital of $40,000 contemplated the erection of a curling rink. Col. McKenzie, interested.

Tillsonburg, Ont.

Tillson & Co., have had plans drawn for a steam heating system costing $15,000. E. V. Tillson has plans and specifications and is open for suggestions before calling tendeds.

Toronto, Ont.

York Mills Builders Supplies Co. Ltd., have recently incorporated with a capital of $40,000 to deal in builders supplies, making a specialty of concrete blocks. D. G. Joy and W. Forsyth, York Mills, P. O., interested.

Windsor, Ont.

Considine-Reid Limited, a recently incorporated company, capital $100,000, head office Windsor, will operate as contractors and dealers in concrete, cement, and other materials which can be used by builders and contractors.

Late News

Montreal, Que.

H. L. Fetherstonaugh, architect, has moved his offices from 85 Osborne St., to 364 Dorchester St. west.

Oshawa, Ont.

The general contract for pavements, curbs and gutters for Arthur and Bruce Sts. from Drew St. to Ritson Rd. has been awarded to the Standard Paving Co., Central Chambers. This Company also has the general contract for pavements, curbs and gutters on Division St. from King to Brock St. All pavements will be concrete base with asphalt surface.

Ste. Anne de Beaupre, Que.

Nap. Trudel, St. Irene, has the general contract for a macadam road two miles long for Montmorency County Council, Costing $28,000. G. Henry, Roads Department, Parliament Buildings, Quebec, engineers. Materials will be bought by the general contractor.

St. Elphege, Jue.

Cie D'Aqueduc de St. Elphege contemplate building and aqueduct costing $7,000. Joseph Farly is interested in this project.

Willowdale, Ont.

Murray Brown, architect, Confederation Life Bldg., Toronto, is receiving tenders for a $20,000 office building for North York Township until May 10. This structure will be of structural steel, tile and brick, two storeys and a basement and will be erected at the corner of Yonge and Empress Sts.

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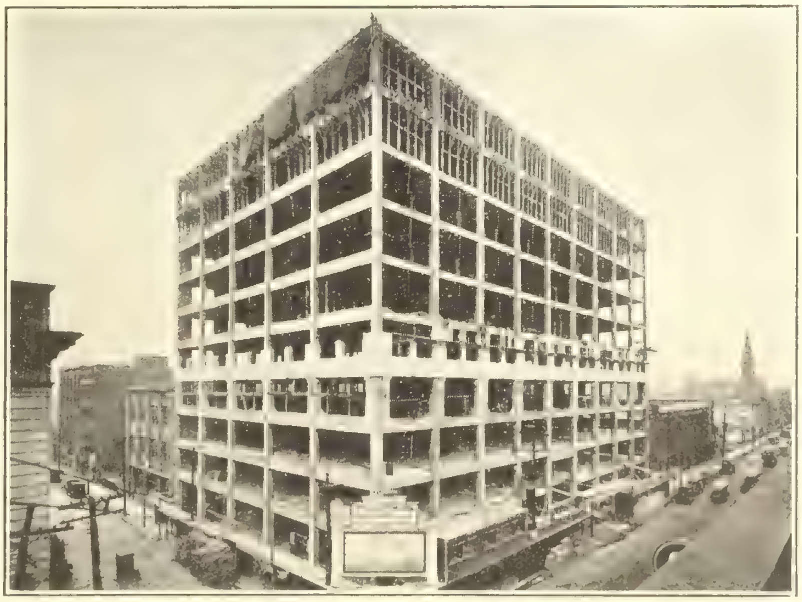
You'll be interested in the facts contained in this book. A copy is yours for the asking.



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Monster Steel Caisson

The largest steel caisson ever used in bridge or tunnel construction was launched recently at the Staton Island Shipbuilding Company's plant, Mariner's Harbor, S. I. and after being tested for water tightness and having its cutting edge concreted will be towed to its final resting place near Pier 35, Hudson River. Here it will form a link of the New York and New Jersy underwater motorway, which is receiving attention from engineers all over the world.

This caisson was built on ways like a ship and slid off into Kill van Kull in the same manner as a pleasure boat or man-of-war is launched. Completed, it will weigh about 15,000 tons. It will fiill the double capacity of working chamber and ventilating shaft for the new tunnel which is to relieve the congestion of crowded ferries by taking care of motor traffic crossing underneath the Hudson river.

This caisson, which looks like an oblong drygoods box, is now 35 feet high, but its final proportions when it reaches its resting place beneath the bed of the river will be 108 feet high, 93 feet long and 37 feet wide. There will be a steel box within a steel box and the five feet between the outer box and the inner one will be filled with concrete. On the New Jersy side two caissons for the river shafts will be placed, instead of another monster caisson similar to the one on the New York side. In all, seven of these oblong steel and concrete drygoods boxes will be used in constructing the tunnel, and will form part of its ventilating system. No one of the seven, however, is nearly so large as the big one at the head of Pier 35. The caisson will draw 25 feet of water when being towed to Pier 35, as much as all but the largest ocean liners.

As excavation of the bed of the river progresses the caisson keeps sinking, and the top of it is built up and up. This construction will continue until the caisson, which will ultimately rest in about 37 feet of water, drives its way through 40 ft of clay and almost the same depth of rock; in fact, until it finds its permanent place 12 feet or so below the bottom of the tunnel. Slowly the big steel creation forces its way down through the rock and the clay as the material below it is excavated and carried up through its length to the top.

Rockets Aid Bridge Building

The best suspension bridge in England is at Clifton. It is 702 feet long and 31 feet wide, and more than 200 feet above the River Avon. It is said that the cable was put in place by the aid of a kite. First a string was sent over by a kite, then a heavier cord was pulled across, then a heavier and heavier, and finally the cable.

A more unusual way was adopted for starting the great bridge across the Zambesi river in South Africa. The bridge is the highest in the world, 400 feet above the water, and runs from cliff to cliff.

A rocket to which a string was attached was used at the beginning of construction. The rocket took the cord across, the cord was used for hauling across a wire and the wire was used to pull over a small cable. On this a truck crossed, carrying the main cable of the bridge, which is 200 feet long, and the greatest engineering wonder in South Africa.

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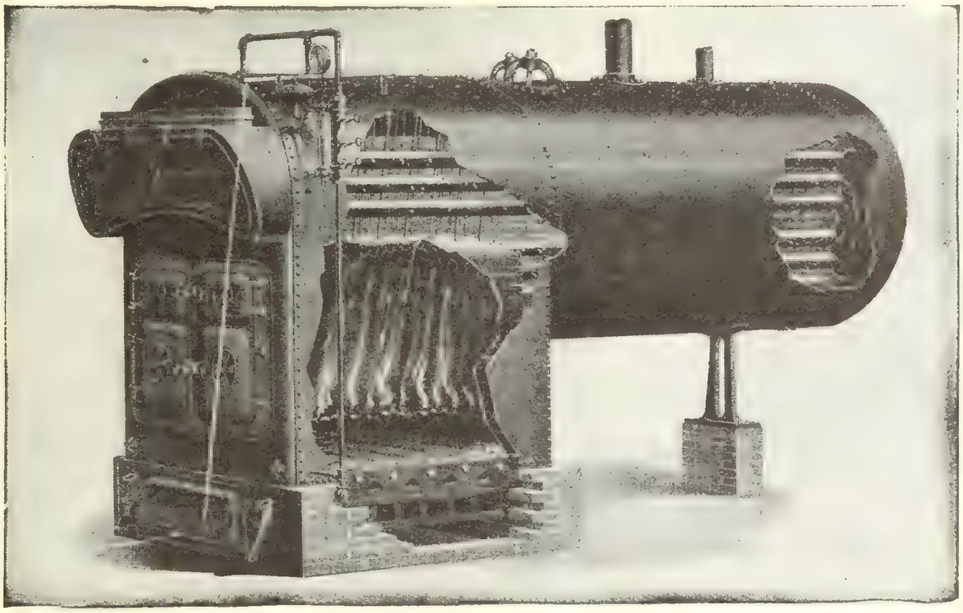

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Current Prices of Building and Engineering Materials

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CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.35
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	11.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	30.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*'	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to	230.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		50.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 "	" "
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.75 base	3.75 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.25 "	3.75 "	5.10 base	
Hoops	per 100 lbs.	5.00 "	4.75 "		
Twisted and deformed bars	per 100 lbs.	3.75 "	3.75 "	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	3.90 "	3.75 "	5.35	6.00
Structural shapes	per 100 lbs.	4.00 "	4.00 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.50 "	3.75 "	5.15	6.25
Plates—3/16 in.	per 100 lbs.	4.00 "	4.10 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.40 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.50 "	5.10 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.90	7.00	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.65 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
Cast iron pipe	per ton	65.00	60.00		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.28
Sewer pipe, 6 in	per ft.	.60	.45	.45	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

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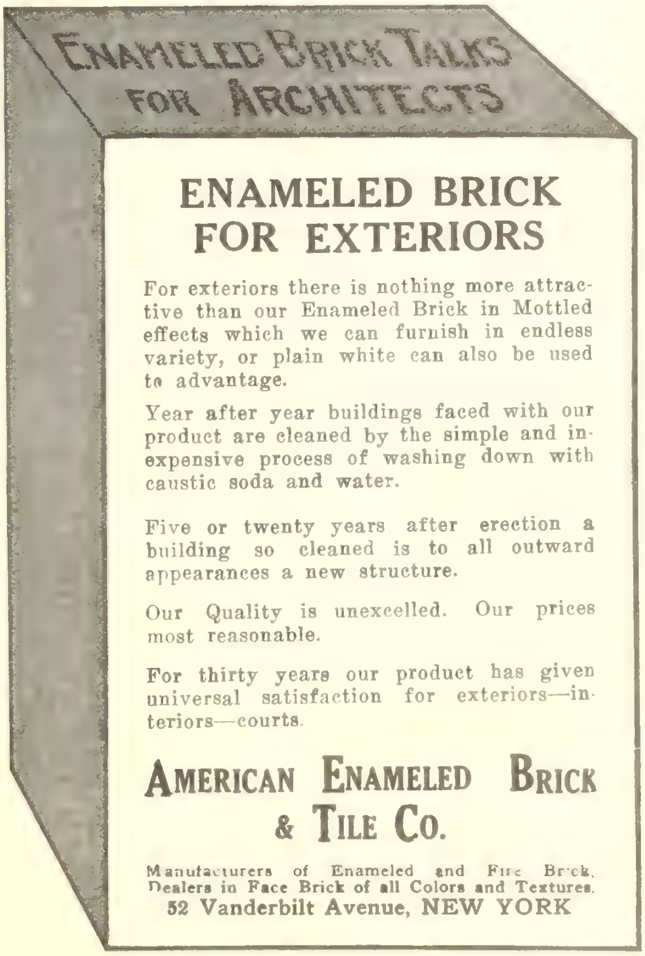
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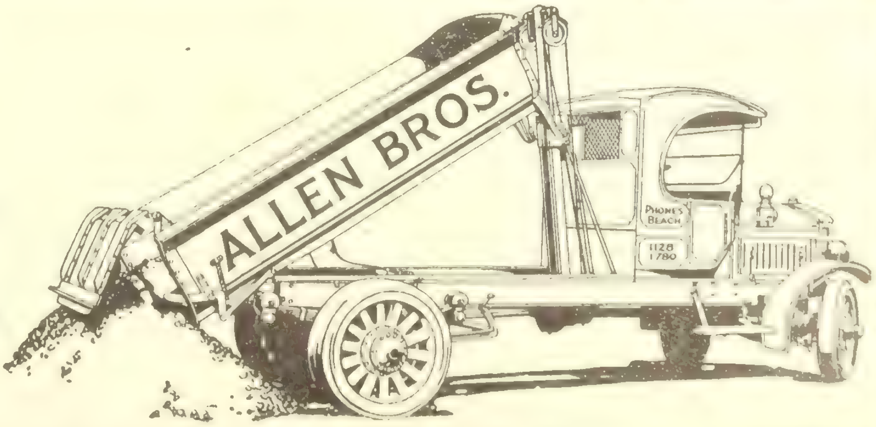


CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS—continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	94.50	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	30.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	30.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	42/45	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	50/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.50	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	

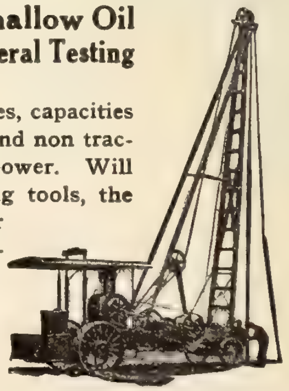
PAINTS, OILS, COLOURS (delivered):—		Toronto	Montreal	Winnipeg	Vancouver
White lead ground in oil, less than ton lots	per cwt.	14.55	14.60	15.60	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	5.95	4.25	5.50	9.25
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.28	1.40	1.26	1.28
Raw linseed oil, in bbls.	per gal.	1.25	1.38	1.23	1.25
Turpentine, in bbls.	per gal.	2.25	2.20	2.50	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45

PLASTER (Delivered):—		Toronto	Montreal	Winnipeg	Vancouver
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	30.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50

LABOR:—		Toronto	Montreal	Winnipeg	Vancouver
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.00	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.80	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Sheet Metal Workers	per hr.	.75			.90

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

PLASTER *Including bags.



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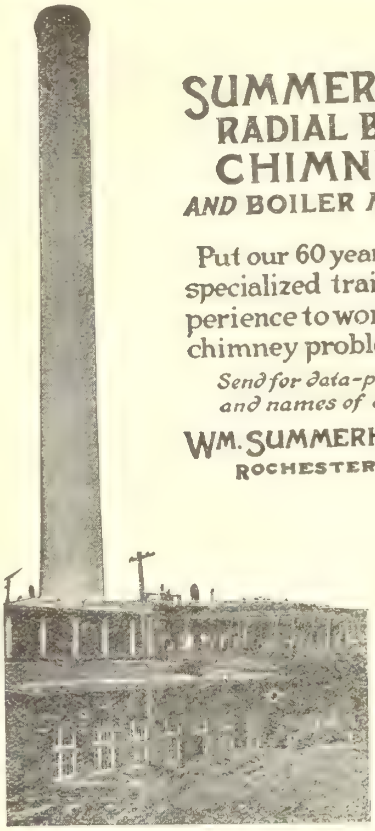

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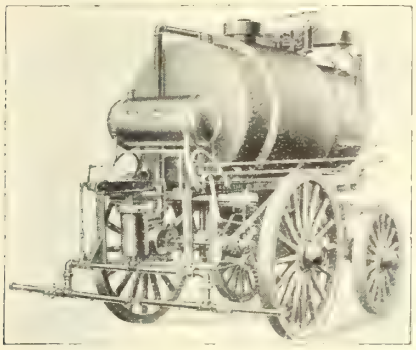

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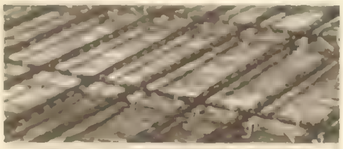

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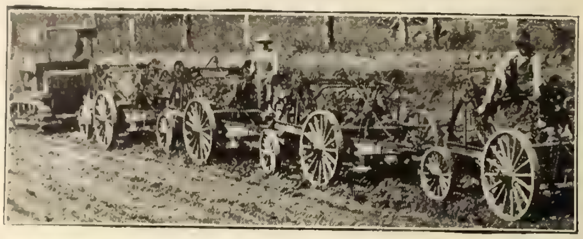

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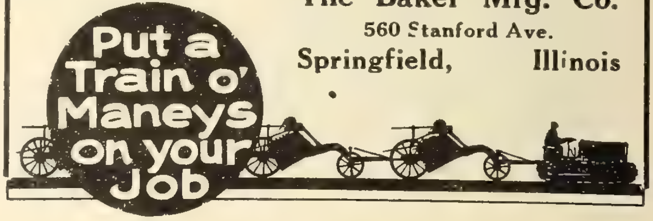
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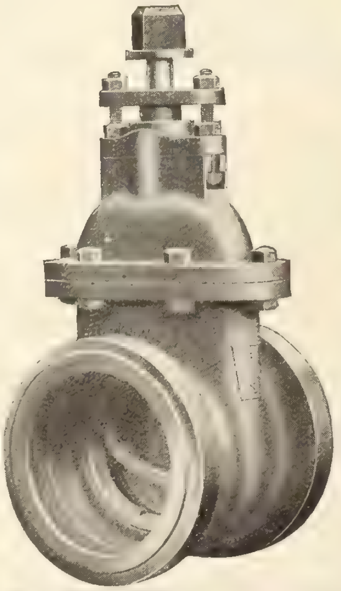

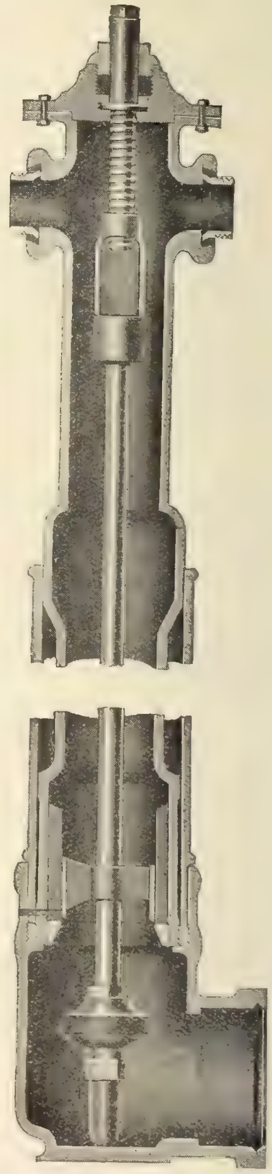

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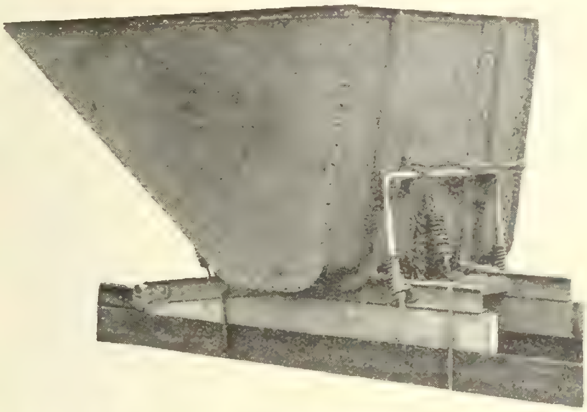

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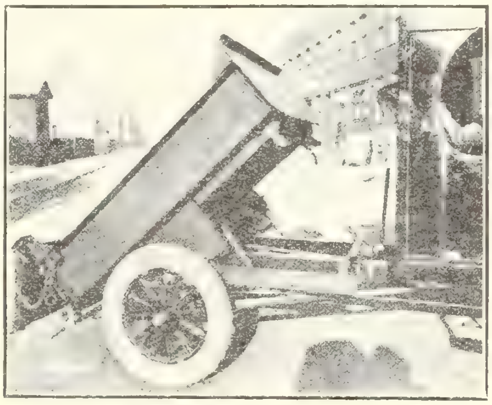

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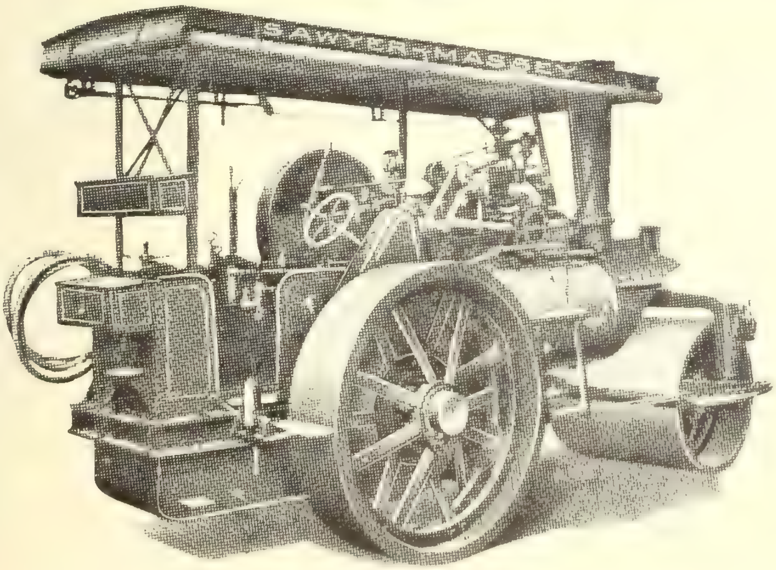

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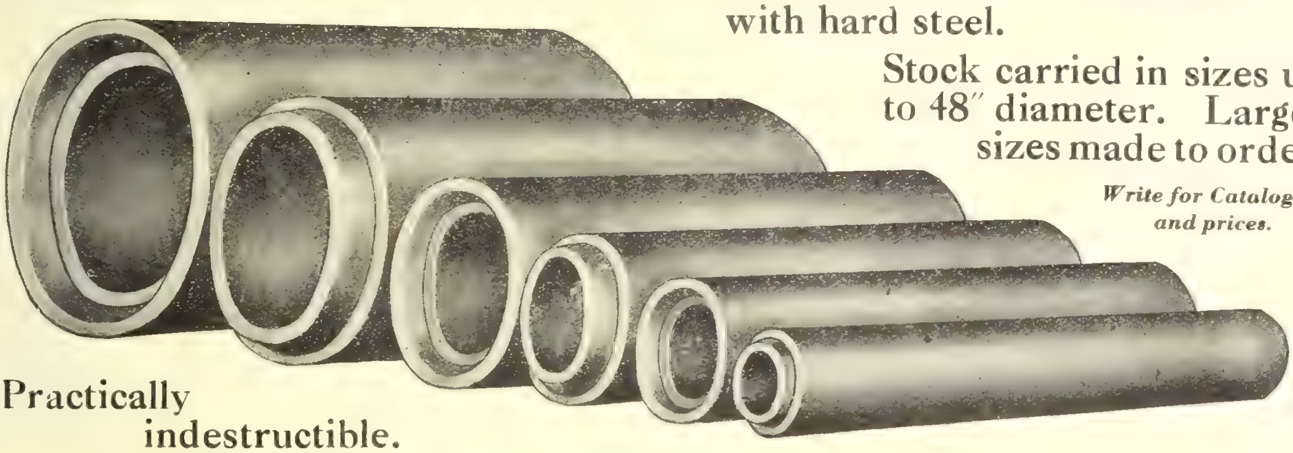

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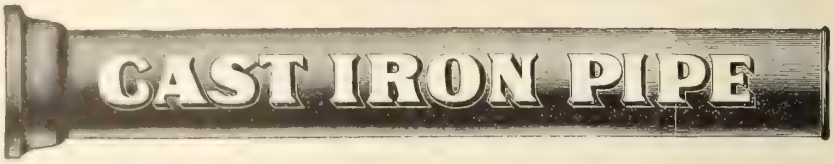

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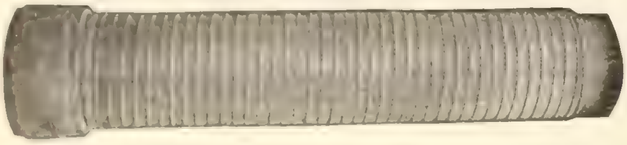

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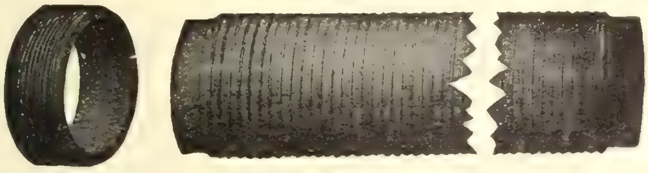

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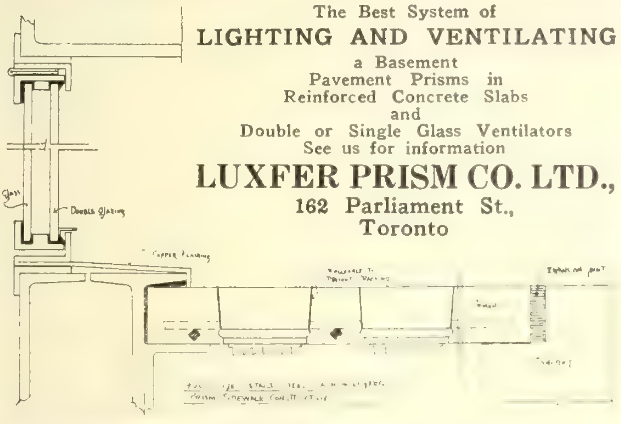

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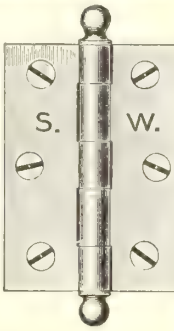

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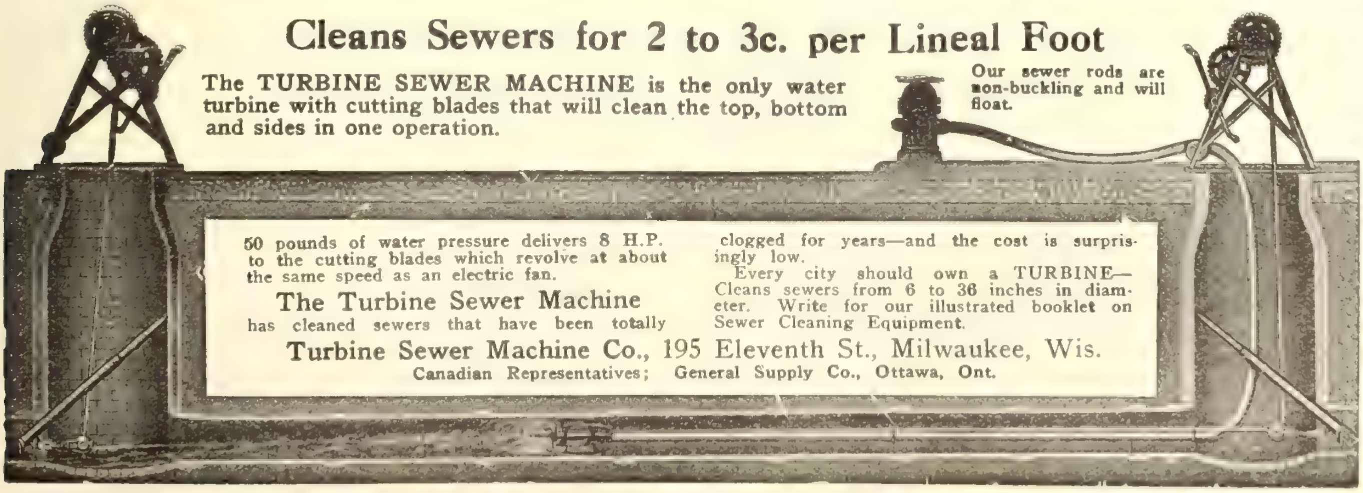

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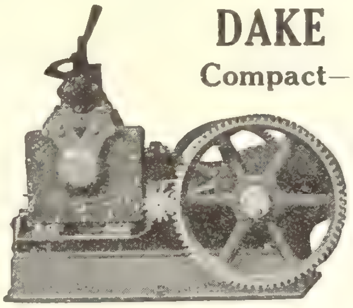

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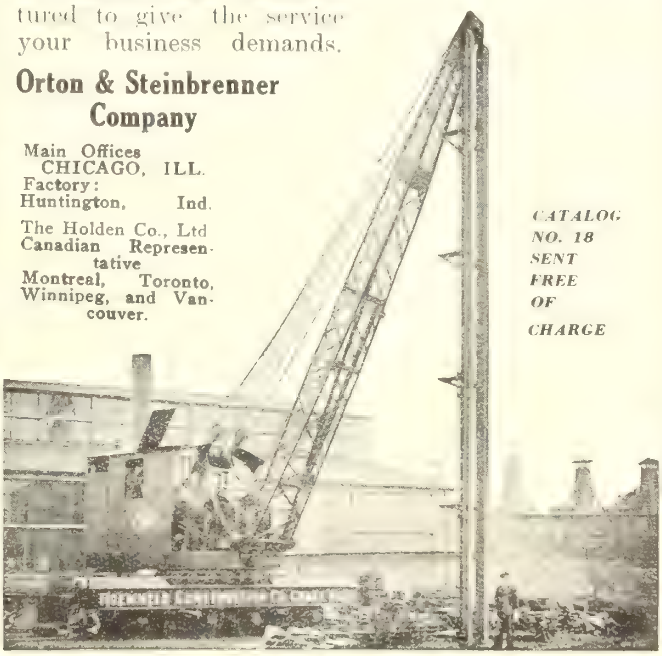

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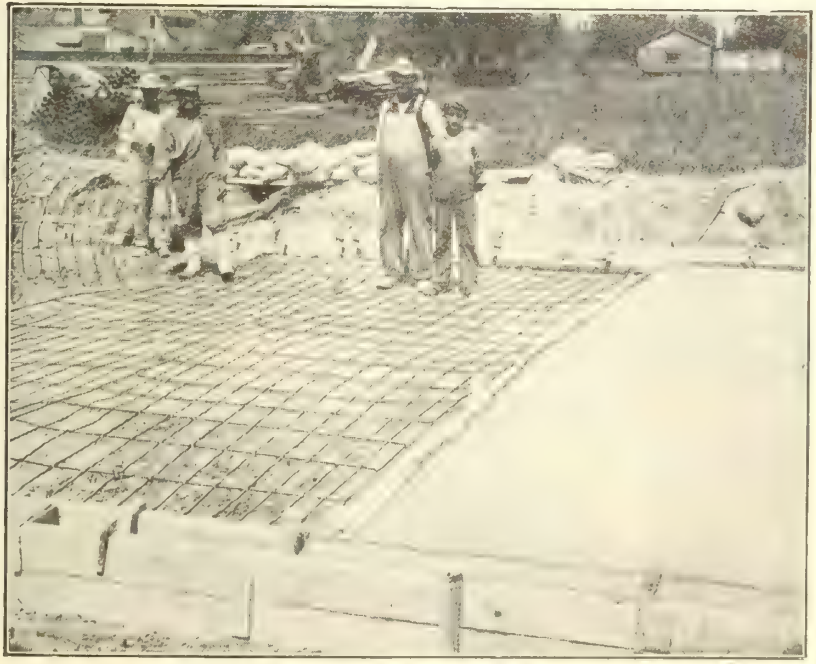

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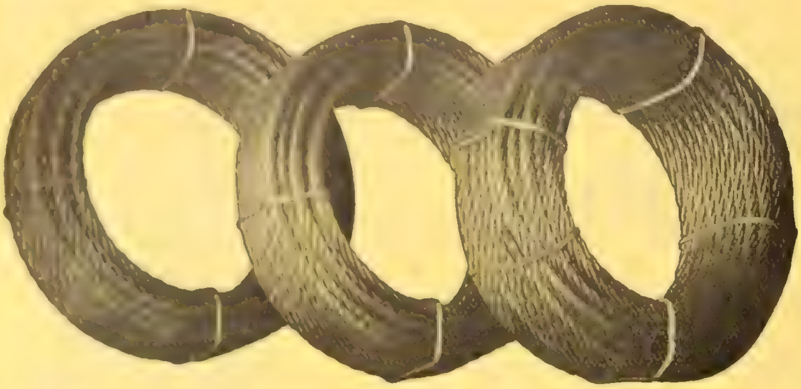

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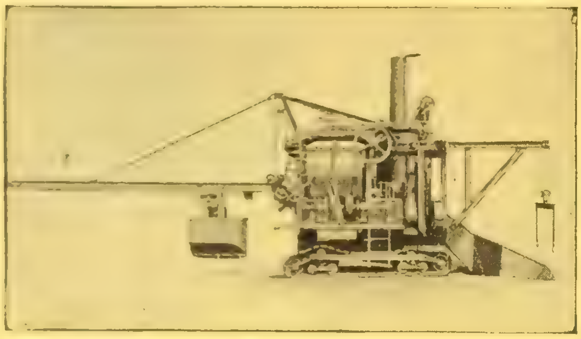

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Vol. 37 Toronto, May 9, 1923 No 19

Contract Record and Engineering Review

MT. ROYAL HOTEL
MONTREAL, CANADA

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Crane, Ltd., - - - - Plumbing Fixtures
T. J. Dyer Co. Ltd., - - - Plumbing Contractor

Equipped throughout with—

Royal Flush Valves

SLOAN VALVE CO., LTD.
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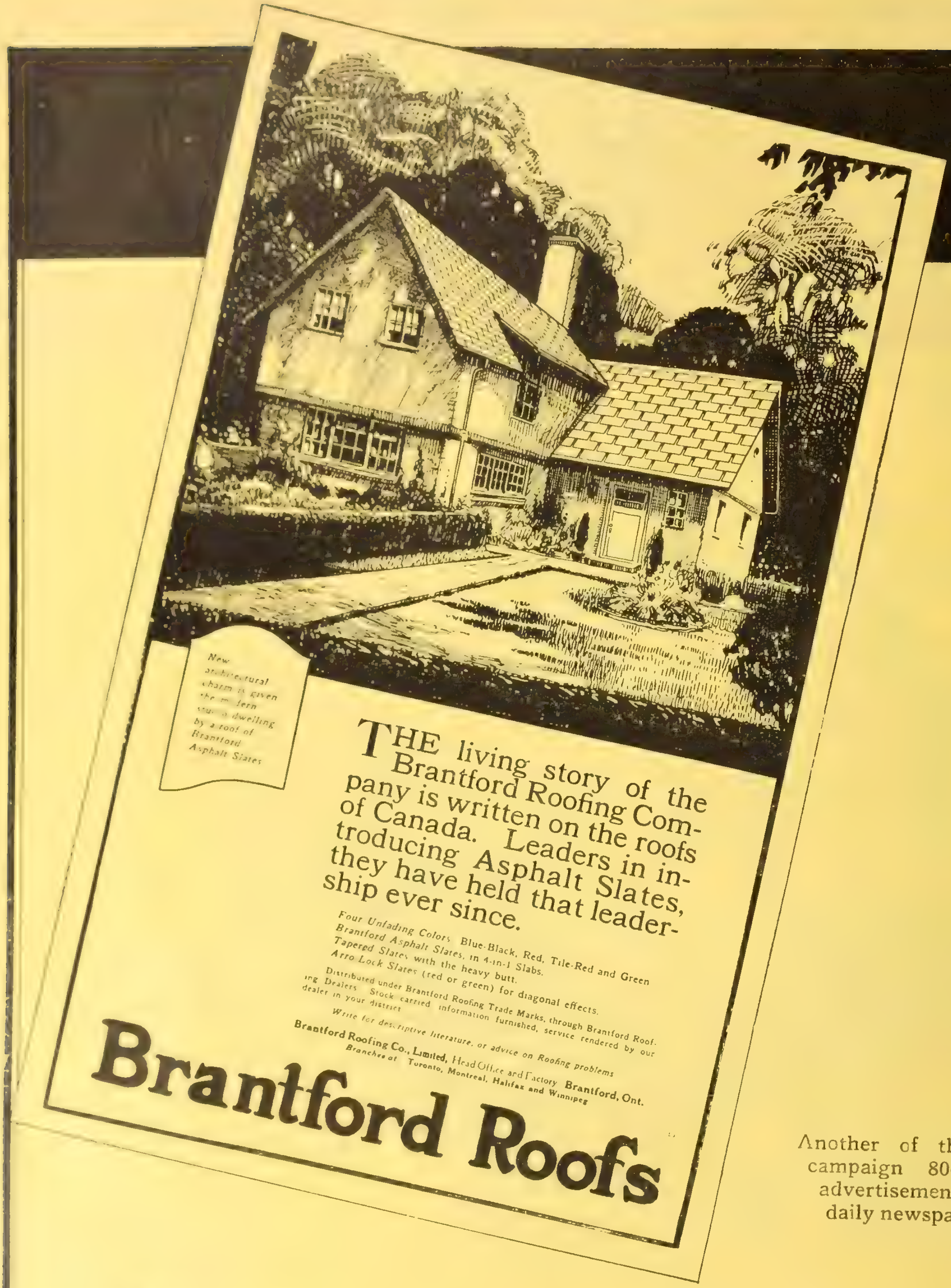
Alphabetical Index to Advertisers Page 16 Classified Directory to Advertisements Page 6



New architectural charm is given the modern stucco dwelling by a roof of Brantford Asphalt Slates

THE living story of the Brantford Roofing Company is written on the roofs of Canada. Leaders in introducing Asphalt Slates, they have held that leadership ever since.

Four Unfading Colors Blue-Black, Red, Tile-Red and Green
Brantford Asphalt Slates, in 4-in-1 Slabs.
Tapered Slates with the heavy butt.
Arro Lock Slates (red or green) for diagonal effects.

Distributed under Brantford Roofing Trade Marks, through Brantford Roofing Dealers. Stock carried, information furnished, service rendered by our dealer in your district.

Write for descriptive literature, or advice on Roofing problems

Brantford Roofing Co., Limited, Head Office and Factory **Brantford, Ont.**
Branches at **Toronto, Montreal, Halifax and Winnipeg**

Brantford Roofs

Another of the 1923 campaign 800 line advertisements in daily newspapers.

Homes of every class and size are now built with Brantford Roofs. The market grows from year to year.

Contractors Selling Brantford Roofs Get the Business

LONDON CONCRETE MIXERS

are being used extensively on Canada's construction work. WHY? Because the contractor is assured of reliable and economical service.

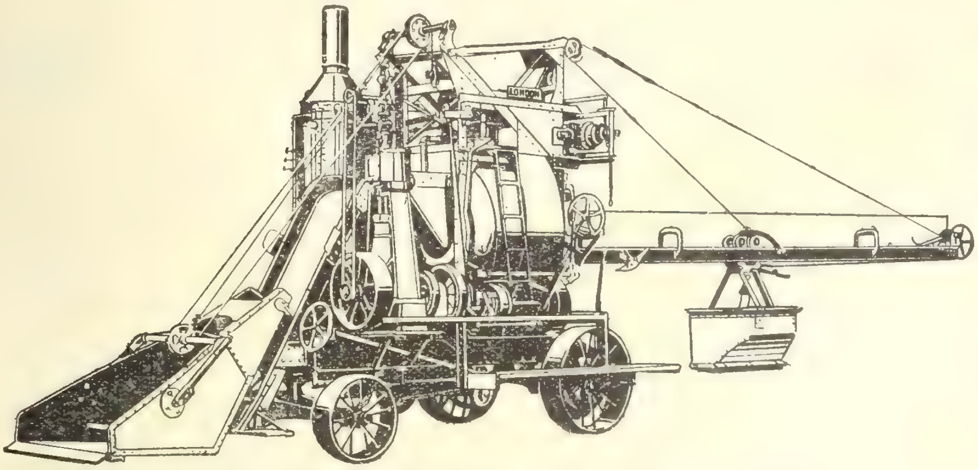


Fig. 16 B. London Paving Mixer. Made in two sizes with Rotary Delivery Chute and also with Boom and Bucket and full Creeper (Caterpillar) Traction. Described in Bulletin 49-K-B.

They are being specified by Engineers who know from experience that the first cost of a machine should not be the deciding factor when purchasing equipment.

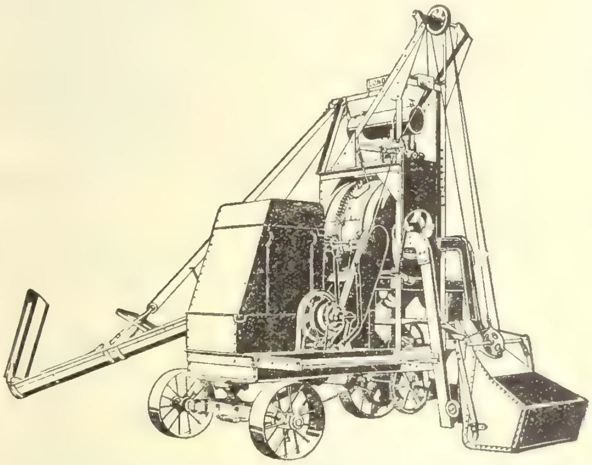


Fig. 801. London Traction Sidewalk Mixer. Travels along the street under its own power and deposits the concrete on the sidewalk while moving. Described in Bulletin 49-L.

We are demonstrating daily that our factory in London, Canada, produces machines that more than meet the competition of the world. Our foreign orders verify this statement. Last month a British engineering firm having a large Government contract in China, after much investigation, purchased TEN LONDON MACHINES ON ONE ORDER for shipment to Hong Kong. London Machines have an enviable reputation both at home and abroad.

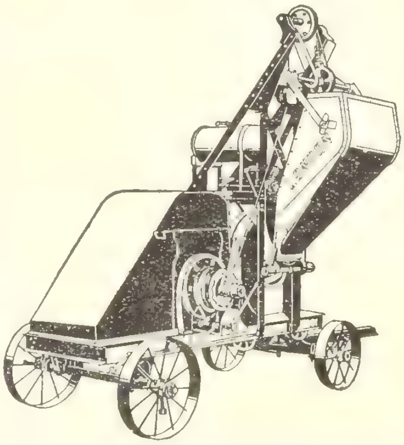


Fig. 33. London Heavy Duty Builders' Mixers. Built in five sizes with steam, gasoline or electric power. Described in Bulletin 49-F-1.

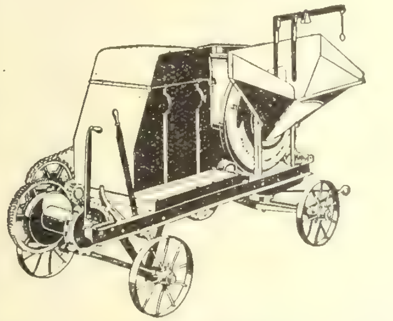


Fig. 25. London Combination Mixers. Built in two sizes. Two Machines in one. A Concrete Mixer and a real Hoisting Drum built into one unit. Described in Bulletin 49-D-1.

Made in Canada

We manufacture Concrete Mixers, Hoists, Air Compressors, Pumps, Brick Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

The London Concrete Machinery Co., Limited

Dept. 7 London, Canada

World's Largest Manufacturers of Concrete Machinery

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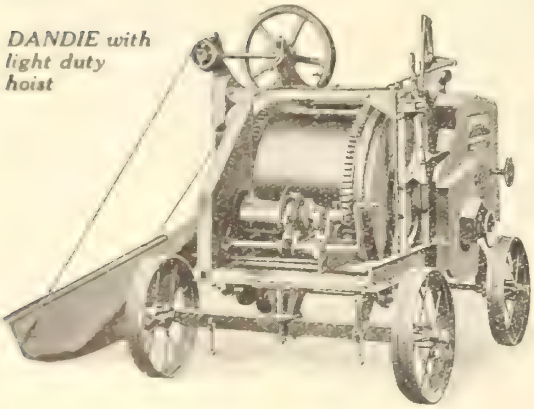
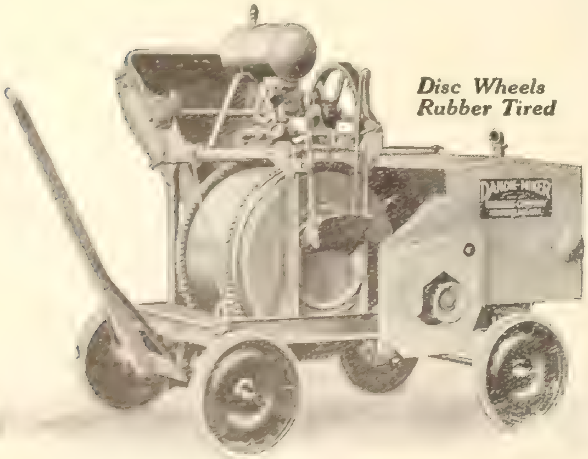
KOEHRING

DANDIE Light Mixer


DANDIE with light duty hoist

Capacities

4 and 7 cu. ft. mixed concrete, steam or gasoline. May be equipped with light duty hoist, power charging skip, low charging platform, automatic water measuring tank. Send back the coupon.


Disc Wheels Rubber Tired

Send back the coupon

GET the details of Dandie mixer construction, and find out why the Dandie is the most remarkable value in the light mixer field — not the cheapest mixer in price — but the strongest, built mixer with greatest yardage per day performance.

The Dandie catalog will give you a new basis for judging light mixer values—a new standard for trouble-free dependability, and long service life. Send back the coupon today.

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KOEHRING COMPANY OF CANADA LTD.,
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No. 34 Please send, without obligation to me, full information about Dandie Light Mixer.

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THE use of Metal Lath is a real economy. It requires less labor to put on and less plaster to finish. The bond between the metal mesh and the plaster is permanent. It makes a wall that is an effective fire-stop—a wall that will not crack and that is vermin-proof. Architects working on the better class of buildings are more and more anxious to specify Metal Lath for all plastered walls.

We also manufacture Steelcrete, Metal Floor Tile, Metal Roofing and Siding, Rib Fabric, Metal Culverts, etc.

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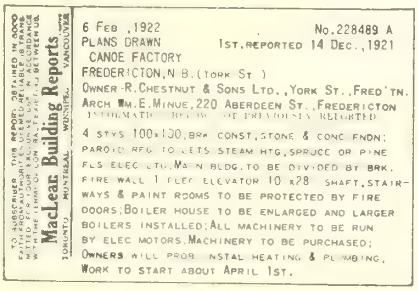
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Heating Apparatus
Canadian Blower & Forge Co.
Crane, Limited
Sturtevant, B. F. & Co.

Hoists, Electric
Canadian Austin Machinery
Canadian Link-Belt Co.
Clyde Iron Works Sales Co.

Hoists (Truck)
Dominion Truck Equipment Co.
Wood Hydraulic Hoist & Body Co., Ltd.

Hoisting Apparatus
Canadian Austin Machinery
Canadian Ingersoll Rand Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Hopkins & Co., Ltd., F. H.
Industrial Works
London Concrete Machry. Co.
Mussens Limited
Watson Jack & Co.

Hoisting Engines
Hamilton Co., Wm.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
General Products Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
London Concrete Machry. Co.
McGovern, T. J.
Mussens Limited
Turnbull & Co., Harvard

Hydrants
Canada Iron Foundries
Dominion Steel Products Ltd.
Kerr Engine Company
Gartshore-Thompson Pipe Co.
McAvity & Sons, T.
Hepburn, Ltd., John T.

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Melville Quarry Co.
Muldoon, Ltd., J.
Standard Lime Co.

Ice Making Machinery
Canadian Ingersoll Rand Co.
York Manufacturing Co.

Industrial Cars
Canadian Austin Machinery
Canadian Equipment Co.
Hopkins & Co., Ltd., F. H.
MacKinnon Steel Company
Mussens Limited

Inspection Engineers
Canadian Inspection & Testing Laboratories
Hunt & Co., Robt. W.
Milton Hersey Company

Insulating Compounds
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.
Standard Underground Cable Co., of Canada Ltd.

Jib Cranes (all kinds)
Hamilton Bridge Works Co.

Joist Hangers
Hamilton Bridge Works Co.

Kilns
Canadian Blower & Forge Co.
Horton Steel Works, Ltd.
MacKinnon Steel Company

Lead Pencils
American Lead Pencil Co.

Lime
Standard Lime Co.
Muldoon, Ltd., J.

Limestone
Deschambault Quarry Sorpn.

Hydrated Lime
Standard White Lime Co.

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Canada Wire & Iron Goods Co.

Locomotive Cranes
Ball Engine Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Link-Belt Co.
Erie Steam Shovel Co.
General Products Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
McGovern, T. J.
Mussens Limited
Orton & Steinbrenner Co.

Locomotive Steam
Canadian Equipment Co.

Locomotive Gasoline and Storage Battery
Canadian Austin Machinery
Fate-Root-Heath Co.
Koehring Co., of Canada

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Oakley & Sons, Geo.

Mechanical Rubber Goods
Jenkins Bros. Ltd.

Metal Lath
General Products Co.
Ormsby Company, A. B.

Meters
Builders Iron Foundry

Mine Cars
Philip Gies Foundry

Motors
Lincoln Electric Co., of Canada Ltd.
Sturtevant, B. F. & Co.

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Canadian Des Moines Steel Co.
Hamilton Bridge Works Co.
Hamilton Co., Wm.
Horton Steel Works, Ltd.
MacKinnon Steel Company

Orange Peel Buckets
Orton & Steinbrenner Co.

Ornamental Iron
Dennis Wire & Iron Works Co.

Ornamental Moulds
London Concrete Machry. Co.

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Barrett Company, Ltd.
Spielman Agencies Regd.

Paints and Varnishes
Hopkins & Co., Ltd., F. H.
Spielman Agencies Regd.

Paints (Bridge and Structural Iron and Pipe Coating)
Britnell, Limited
Canada Paint Co.
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.

Paving and Paving Materials
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Lumsden Engineering & Contracting Co.
Standard Lime Co.
Pacific Coast Pipe Co.
Vancouver Wood Pipe & Tank Company

Pencils (Lead)
American Lead Pencil Co.

Penstocks (Wood Stave)
Hamilton Bridge Works Co.
Pacific Coast Pipe Co.

Perforated Metals
Canada Iron & Wire Works

Pile Driving Machinery
Canadian Mead-Morrison Co.
Clyde Iron Works
Hopkins & Co., Ltd., F. H.
Mussens Limited

Pipe (Concrete, Iron & Wood)
Canada Iron Foundries
Canadian Pipe Co.
Dominion Concrete Company
Gartshore, Thompson Pipe Co.
National Iron Corporation

Pipe Covering (Cold and Steam)
Canadian Johns-Manville Co.

Pipe and Tapping Machines
H. Mueller Mfg. Co., Limited

Pitch
Dom. Tar & Chemical Co., Ltd.

Planing Mill Exhausters
Canadian Blower & Forge Co.

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Britnell & Company
De Giorgio, Limited

Plastering
Hynes Co., W. J.

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Laurie & Lamb

Posts (Indicator)
Jenkins Bros. Ltd.

Power Engines
Inglis Co., John

Prisms
Luxfer Prism Co.

Propeller Fans
Sturtevant, B. F. & Co.

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Hepburn, Ltd., John T.
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Inglis Co., John
Koehring Co., of Canada
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McDougall Co., Ltd.
Mussens Limited
Waterous Engine Works Co.

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Jenkins Bros. Ltd.

Quarry Machinery
Hopkins & Co., Ltd., F. H.
McGovern, T. J.
Mussens Limited

Radiators (Steam Taps)
Canadian Johns-Manville Co.

Rails
Gartshore, John J.
Hopkins & Co., Ltd., F. H.
Mussens Limited

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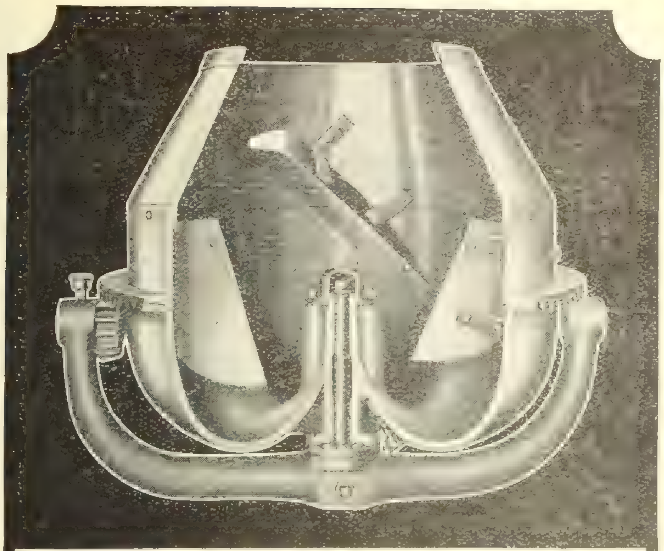


When In Doubt Buy a WONDER

TWELVE years ago the Construction Machinery Company originated the SINGLE-BEARING WONDER MIXER. Unhampered by precedent or possibility of infringement we adopted the design of Bearing pictured above—the stationary shaft support and the dust proof Ball Bearing Race to absorb the only wear there should be in a Mixer of this type.

Since then from time to time other Manufacturers attracted by the popularity of the WONDER, have adopted the type, but none have approached the perfection of the WONDER Bearing.

After twelve years of observation and knowledge gained from our thousands of users, it is now possible for the Construction Machinery Company to eliminate all confusion in the minds of the buyer concerning the correct design for the Bearing of a Single Opening Mixer. Without a change in its design during that period the WONDER Bowl Bearing now unqualifiedly carries the following guarantee to the purchaser:

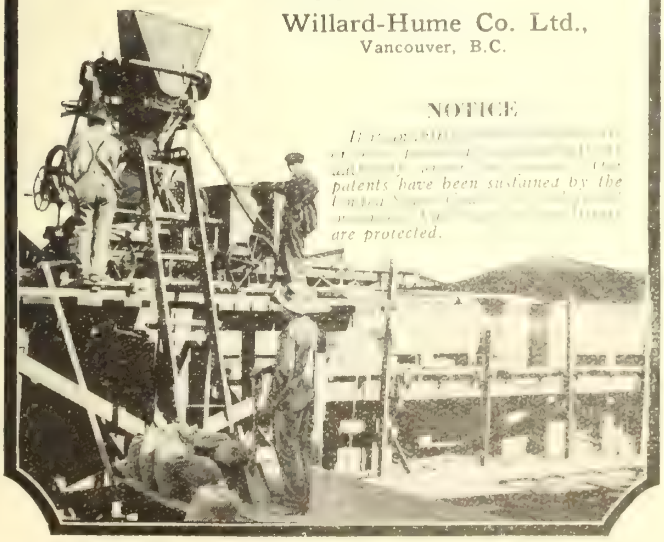
GUARANTEE

We agree to furnish gratis any part of a WONDER MIXER drum bearing, if needed, during the life of a WONDER MIXER.

Construction Machinery Co.,
Waterloo, Iowa, U.S.A.

Braid & McCurdy
Winnipeg, Man.

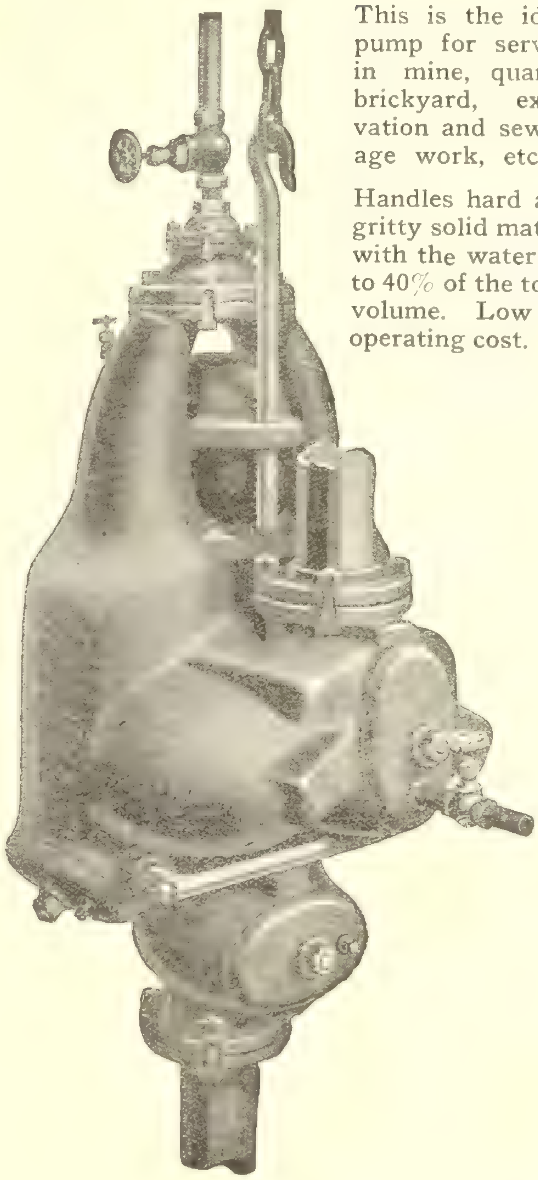
Willard-Hume Co. Ltd.,
Vancouver, B.C.



NOTICE

[illegible] patents have been sustained by the [illegible] are protected.

PULSOMETER STEAM PUMP



This is the ideal pump for service in mine, quarry, brickyard, excavation and sewerage work, etc.

Handles hard and gritty solid matter with the water up to 40% of the total volume. Low in operating cost.

Information and prices gladly furnished on request.

HARVARD TURNBULL & CO.

RAILWAY, MARINE AND CONTRACTORS SUPPLIES
EXCELSIOR LIFE BLDG., TORONTO ST.
TORONTO

Representatives for
Canadian Mead-Morrison Co.
B. J. Coghlin Co.
London Concrete Machinery Co.
Peck Rolling Mills
Pulsometer Steam Pump Co.

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[illegible]
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[illegible] & [illegible] Ltd., F. H.

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[illegible] Steel & Wire Co.

[illegible] Ties
[illegible]

[illegible]
[illegible] Manville Co.
[illegible] Co.

[illegible]
Hopkins & Co., Ltd., F. H.

Riveted Spans
[illegible]

Road Drags
Sarnia Bridge Company

Road Asphalt
Imperial Oil Company, Ltd.

Road Machinery
Baker Mfg. Co.
[illegible]
[illegible] Machinery
Can. Fairbanks-Morse Co., Ltd.
Dominion Road Machry. Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
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[illegible]erman Bros.
[illegible]r-Massey Co.
Waterous Engine Works Co.
[illegible]n Jack & Co.

Road Materials
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Road Oil
Barrett Company, Ltd.
Imperial Oil Company, Ltd.

Road Tar
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Roofing Contractors
A. W. Carmichael Ltd.

Roofing Cement
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Roofing Material
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Brantford Roofing Co.
Canadian Johns-Manville Co.
Dom. Tar & Chemical Cô., Ltd.
Imperial Oil Company, Ltd.
Vitrified Clay Pipe Publicity Bureau

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Leckie Co., John

Rolling Steel Doors
Ormsby Company, A. B.

Rubble Stone
Queenston Quarries Co.

Sand
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Muldoon, Ltd., J.
Paris Sand & Gravel Co.
Rogers Supply Co.
Standard Lime Co.

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Canada Wire & Iron Goods Co.

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Rawplug Co., of Canada
[illegible]

Sewer Cleaning Machines
Turbine Sewer Machine Co.

Sewer Manholes
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Sewer Pipe
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Muldoon, Ltd., J.
[illegible]
Vitrified Clay Pipe Publicity Bureau

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Shingle Stain Oil
Barrett Company, Ltd.
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Canadian Equipment Co.
Canadian Mead-Morrison Co.
Erie Steam Shovel Co.
Hopkins & Co., Ltd., F. H.
McGovern, T. J.
Mussens Limited
Osgood Company
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McGregor & McIntyre

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Silo Moulds
London Concrete Machry. Co.

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Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
MacKinnon Steel Company
McGregor & McIntyre
Standard Steel Construction Co
Waterous Engine Works Co.

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Canadian Des Moines Steel Co.
Horton Steel Works, Ltd.

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Canada Wire & Iron Goods Co.
McGregor & McIntyre

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Canadian Blower & Forge Co.
Canadian Ingersoll Rand Co.
McAvity & Sons, Ltd., T.

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Burlington Steel Company
Hopkins, & Co. Ltd., F. H.
MacKinnon Steel Company
Nova Soctia Steel & Coal Co.
Standard Steel Construction Co.

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Burlington Steel Company
Hopkins, & Co. Ltd., F. H.
Turnbull & Co., Harvard

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MacKinnon Steel Company
Toronto Steel Construction Co.

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Hopkins, & Co. Ltd., F. H.

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Heltzel Steel Form & Iron Co.

Steel Curb Forms
Heltzel Steel Form & Iron Co.

Steel Lockers
Coffey, J. G.

Steel Pipe
Canadian Des Moines Steel Co.
Horton Steel Works, Ltd.
National Equipment Company

Steel Plate Construction
Canadian Des Moines Steel Co.
Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
MacKinnon Steel Company
Standard Steel Construction Co.
Sturtevant, B. F. & Co.
Waterous Engine Works Co.

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Heltzel Steel Form & Iron Co.

Steel Sash
Ormsby Company, A. B.
Can. Metal Window & Steel Products

Steel Sidewalk Forms
Heltzel Steel Form & Iron Co.

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Sturtevant, B. F. & Co.

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Reid & Brown Structural Steel & Iron Works
Sarnia Bridge Company
Standard Steel Construction Co.

Swinging Gears
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Dake Engine Co.

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Canadian Des Moines Steel Co.
Hamilton Bridge Works Co.
Inglis Co., John
McGregor & McIntyre
Waterous Engine Co.

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Canadian Pipe Company
Vancouver Wood Pipe and Tank Company
Pacific Coast Pipe Co.
Dom. Tar & Chemical Co., Ltd.

Tarpaulin
Leckie Co., John

Testing and Inspecting Bureau
Hunt & Company, Robt. W.
Milton Hersey Company

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Erie Clay Products Ltd.
General Products Co.
Italian Mosaic & Tile Co.

Tile Moulds
London Concrete Machry. Co.

Tile Drain
Erie Clay Products Ltd.
National Fireproofing Co.

Tile Hollow
National Fireproofing Co.

Time Recorders
International Business Machines

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Crane Limited
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McAvity & Sons, Ltd., T.
H. Mueller Mfg. Co., Limited
York Manufacturing Co.

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Builders Iron Foundry

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Canada Paint Co.

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Ormsby Company, A. B.

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Leckie Co., John
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Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

The Power

of

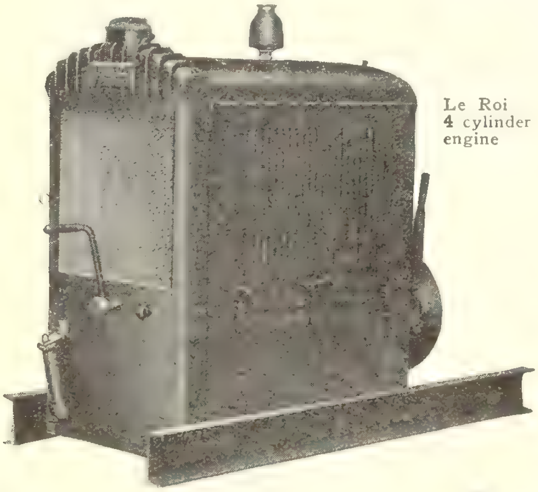
the Hour

“More Power at the Business End—”

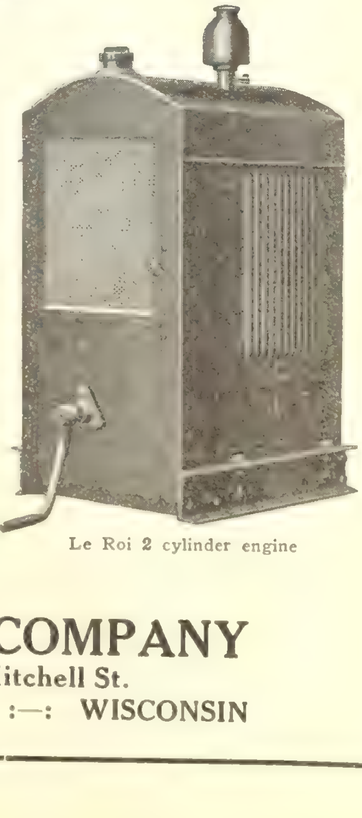
Contractors and Engineers who have used the Le Roi Engines say that they have more power at the business end than any other engine built. This fact is easily explained; Le Roi Engines have.

—Power Built Clear Through Them

This greater power, greater speed, greater capacity, and simple, more rugged construction, with compactness of design and freedom from vibration has made for Le Roi Engines a reputation not to be equalled by other makes.



Le Roi 4 cylinder engine



Le Roi 2 cylinder engine

Contractors operating Concrete Mixers, Pumps, Hoists, Air Compressors and other contracting equipment where the engine must be dependable, invariably prefer and specify Le Roi Engines.

Made in three sizes, **single, double and four cylinder,** with all wearing parts interchangeable.

Send for interesting literature fully describing all three sizes. Write for your copy today.

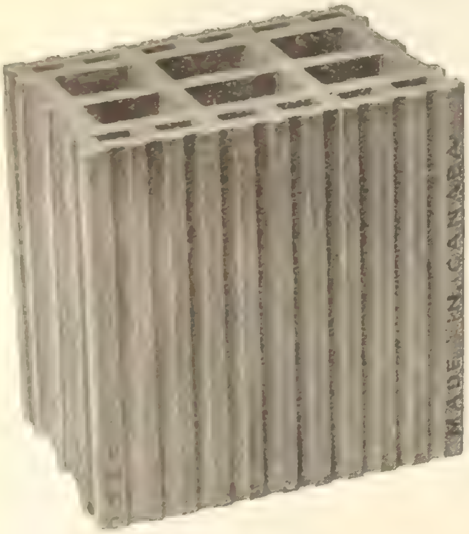
LE ROI COMPANY
5906 Mitchell St.
MILWAUKEE :—: WISCONSIN

LE ROI
ENGINES

Rawlinson School—Glenholme Ave., Toronto, Ont.
Architect—D. R. Franklin
Contractor—H. N. Dancy & Son, Limited.

NATCO HOLLOW TILE

is the successful solution of
Modern School Construction



Improved 8" NATCO **Multicell Tile** Unit showing dovetail method for gripping stucco on exterior and plaster on interior.

Two important factors which must be considered in school design, are quiet classrooms and safety from that dreaded danger—fire. It is because NATCO HOLLOW TILE is fireproof and sound-proof—plus the added advantages of reduced dead loads, insulation against extremes of temperature, rapidity of construction, and last but not least, the most economical form of permanent construction—that NATCO was used for the exterior walls, interior partitions and fireproof floors of the Rawlinson School (illustrated). While the salient principals of NATCO Tile are best illustrated in schools, hotels and public buildings, its purposes are equally applicable to private homes. To build economically and for permanence, use NATCO Hollow Tile in your building.

Complete information on various types of building sent on request.

NATIONAL·FIRE·PROOFING·COMPANY
OF CANADA, LIMITED

Factory: Hamilton, Ont. **Dominion Bank Building, TORONTO**

Why?

WHY do Government regulations specify that contracts for construction, equipment and supplies over a certain minimum amount must be advertised?

WHY do the laws of most Provinces and Municipalities specify the same thing?

WHY do so many private corporations advertise **their** big contracts?

WHY do Consulting Engineers, Architects, and others recommend and endorse the advertising of Contracts To Be Let?

And—

WHY are 90% of the advertisements on which **real national competition** is desired published in **"Contract Record & Engineering Review?"**

In the answers to the foregoing questions you will find unquestionable proof that

1—**Advertised Contracts** are the accepted form of public letting to insure the awarding of contracts free of prejudice.

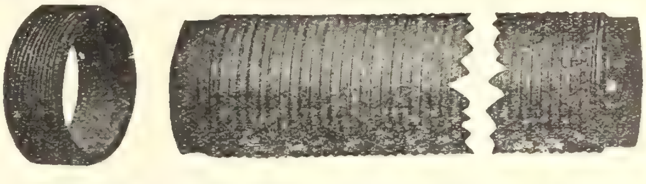
2—**Advertised Contracts** guarantee the greatest possible saving through maximum competition and that—

3—**Contract Record & Engineering Review** is universally recognized as the **one** dominant medium of **national** circulation for advertising Contracts To Be Let.

Are your contracts advertised?

Are they advertised where the right men will read?

If not—why?

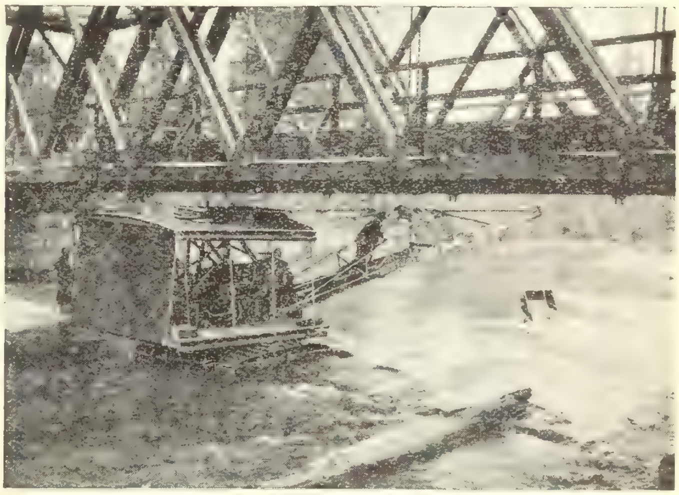


Pacific Coast Pipe Co., Ltd.

Wire Wound Wood Stave Pipe
from 2 in. to 24 in. diameter

Continuous Stave Pipe
from 16 in. to 12 ft. diameter

1551 Granville Street · Vancouver, B.C.



Fording the Lillooet River

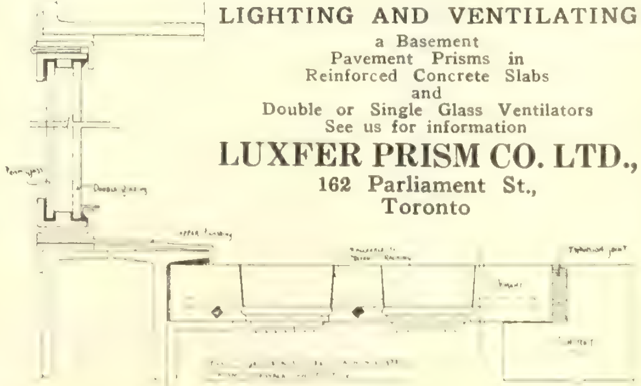
To save the trouble, time and expense of propping up Maple Bridge which joins the banks of the Lillooet River in British Columbia—the P & H Excavator on its dependable Corduroy Traction, forded the river.

It is such unusual cases as this that show the value of the P & H Corduroy which provides the tractive effort necessary to move the 38,000 lbs. over all kinds of country, in and out of ditches, across river bottoms, up grades as steep as 30 degrees.

Bulletin 58-X shows scores of "on-the-job" illustrations—let us mail you a copy.

Pawling & Harnischfeger Co.
Established in 1884
3843 National Ave. Millwaukee, Wisc,

PAWLING & HARNISCHFEGER CO.
P & H EXCAVATORS



The Best System of
LIGHTING AND VENTILATING
a Basement
Pavement Prisms in
Reinforced Concrete Slabs
and
Double or Single Glass Ventilators
See us for information

LUXFER PRISM CO. LTD.,
162 Parliament St.,
Toronto

COMPRESSED AIR

IR "Jackhamer" Drills

We extend you a cordial invitation to visit our booth at the

Good Roads Show
Hamilton, Ont.
June 11-14, 1923

Other I-R Air Tools for the Roadbuilder

PAVING BREAKERS
For breaking up asphalt, concrete, macadam and other hard road surfaces.

"LITTLE DAVID" CLAY DIGGERS
For digging in clay shale or hard dirt.

BACKFILL RAMMERS
For ramming and tamping backfill and surface material.

"LEYNER" SHARPENERS
For forming correctly made rock drill bits and shanks.

"LITTLE TUGGER" HOISTS
Light weight, compressed air hoists which can be set anywhere and operated by anybody.

CAMERON PUMPS
Rugged, simple and dependable. Direct-Acting and Centrifugal. Any type of drive.

THE "JACKHAMER" is the universal one-man, self-rotating rock drill. Light in weight, easy to handle, it can be used wherever a man can stand—on ledges, in trenches, on boulders, for quarrying—anywhere.

The "Jackhamer" will drill holes as deep as 25 feet—and drill these faster and better than any other type of rock drill. No set-up is required, no heavy equipment must be moved; a helper is unnecessary. One man can operate the drill and carry it.

There are five sizes of "Jackhamer" drills—a machine for every rock drilling requirement.

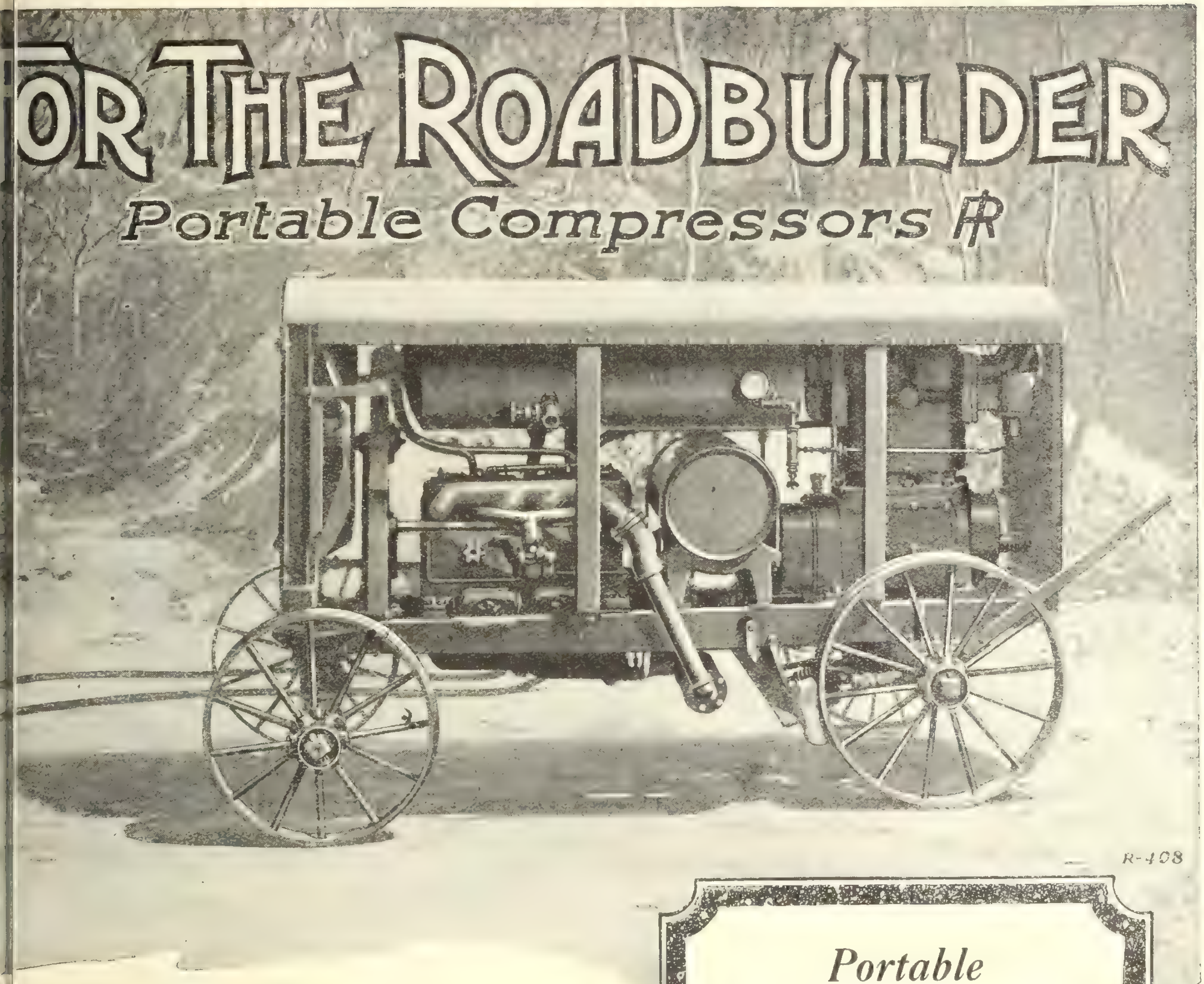
21½ lbs., 35 lbs., 45 lbs., 55 lbs., 70 lbs.

Canadian Ingersoll-Rand

Sydney Sherbrooke Montreal Toronto

Ingerso

Drills Air, Steam and Electric Hoi



-R PORTABLE COMPRESSORS were developed for supplying air to the oadbuilders' "Jackhamer" drills. The two epresent an ideal rock drilling outfit. Drills nd compressor can be moved together, eliminat ng erection of stationary compressor plant and onstant extension of air lines.

he Portable Compressor is a complete, compact plant. ith such an outfit you make your air when and here you want it. Connect up the pneumatic tool, ank the engine and you are ready for work. And hen the unit is not in use, it is protected from weath and meddler by removable Sheet steel side doors.

Portable Compressors

Each outfit is complete with vertical duplex compressor, four cylinder, four cycle, tractor type, gasoline engine or electric motor, air receiver, cooling water system for compressor and engine; fuel tank, and compressor regulators.

GASOLINE ENGINE DRIVEN

91 Cu. Ft. per Min.
160 Cu. Ft. per Min.
210 Cu. Ft. per Min.

ELECTRIC MOTOR DRIVEN

91 Cu. Ft. per Min.
160 Cu. Ft. per Min.
250 Cu. Ft. per Min.

I-R Portable Compressors are described in detail in Forms 3315, 1107, 1112 and 1015. Send for copies now.

ompany, Limited

balt Winnipeg Nelson Vancouver

l-Rand

ble and Stationary Crushers, Screens, Bins, etc.

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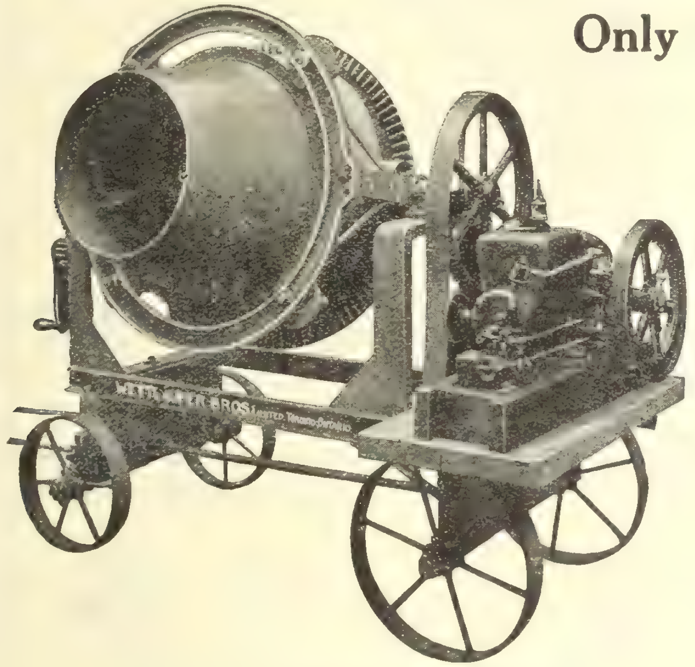

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In Bartlesville, Okla., a Barber-Greene was used to load stone into horse carts on city paving work and did away with all stone shoveling at the storage piles. In Fremont, Ohio, last year 3½ miles of road 16'x6" with 4'x6" curbs were built in 24 days. All the stone used was loaded into wheelbarrows with a Barber-Greene Bucket Loader having a wheelbarrow hopper.

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For additional particulars send for free book "Results on Road Jobs," 1923 edition.

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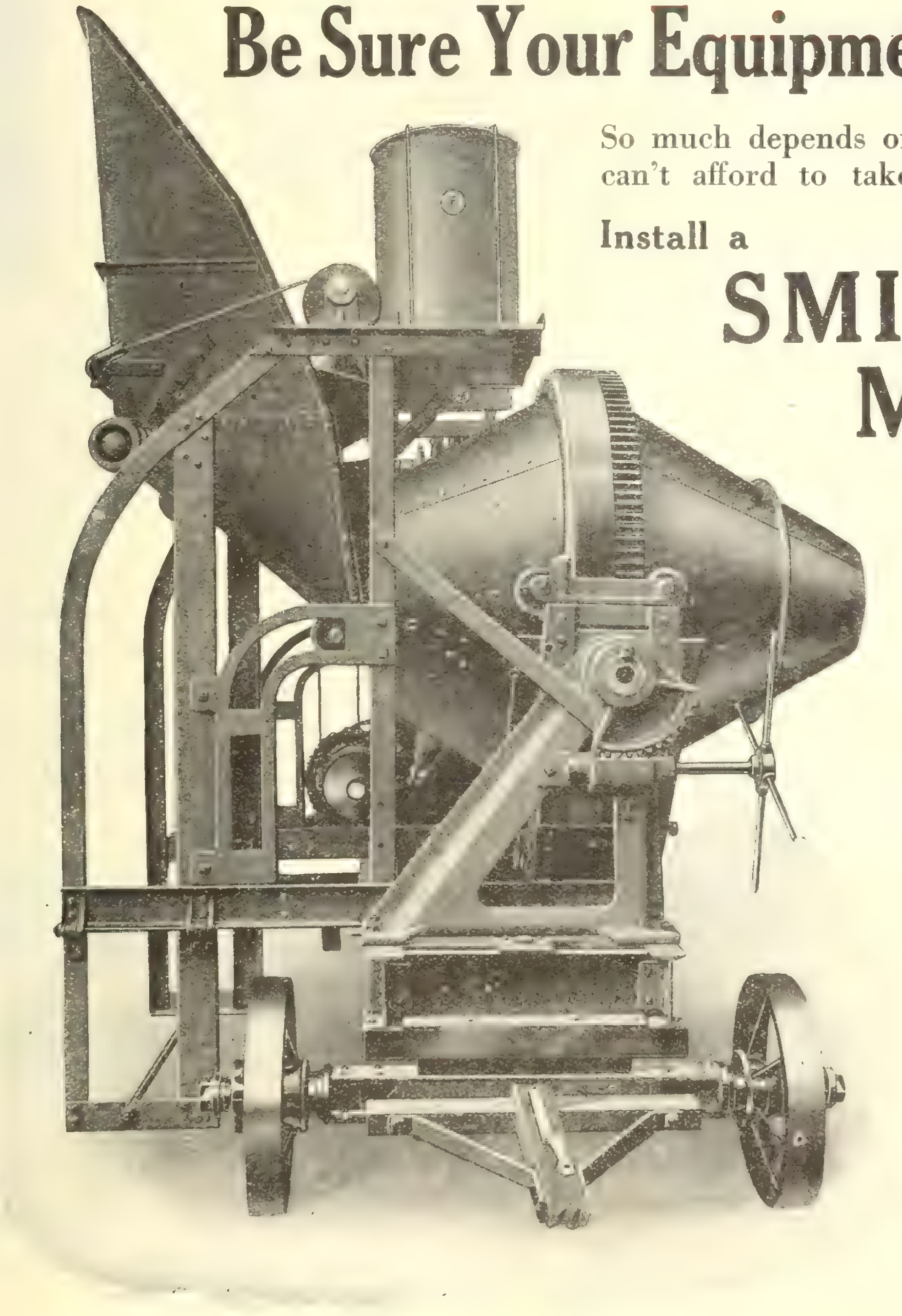

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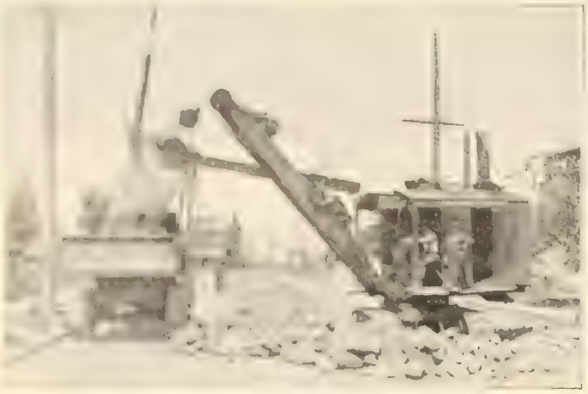

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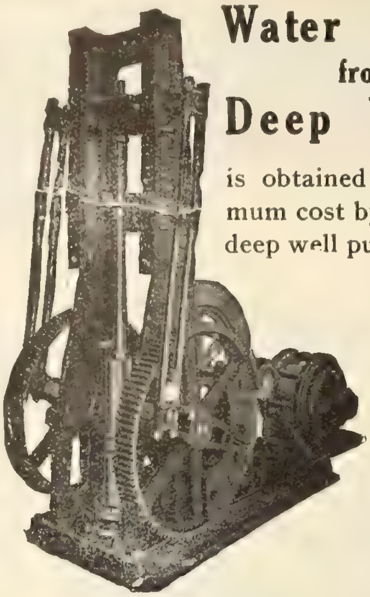

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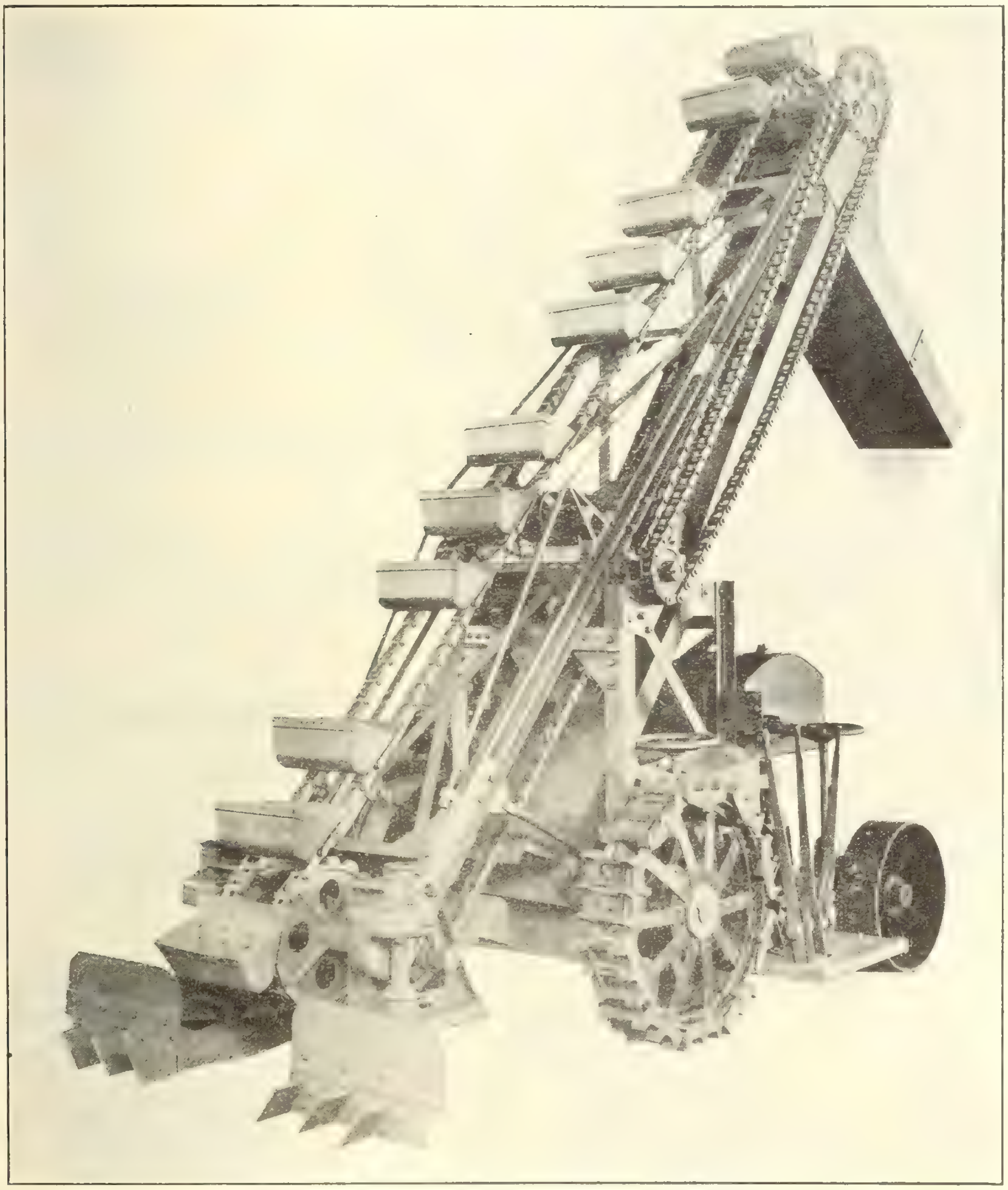

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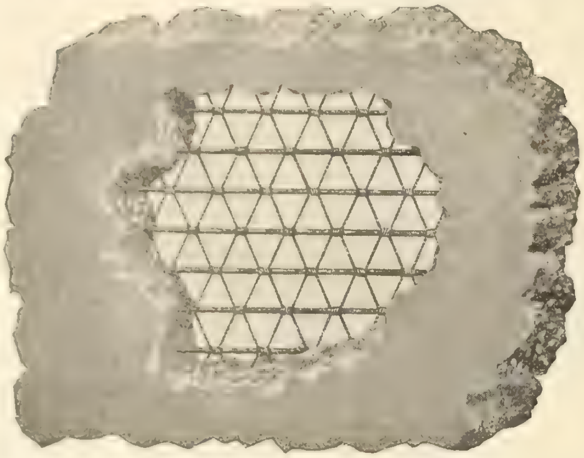

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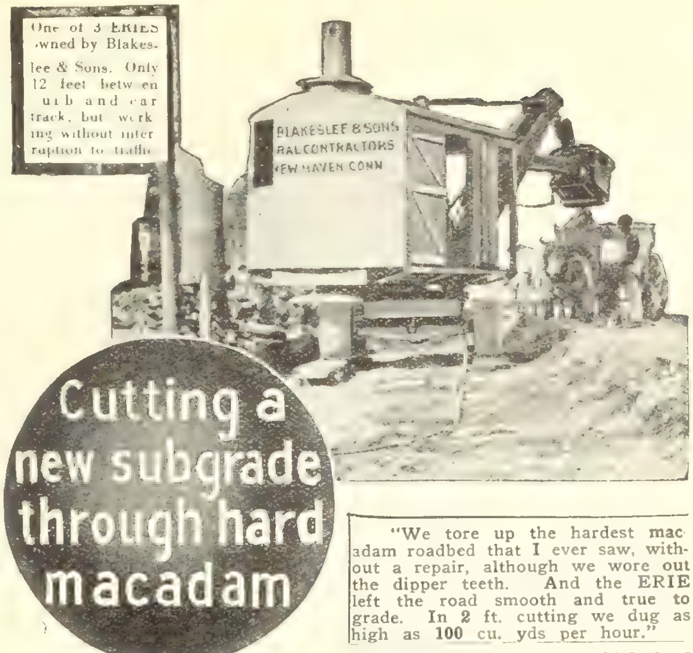

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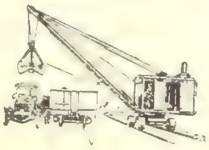

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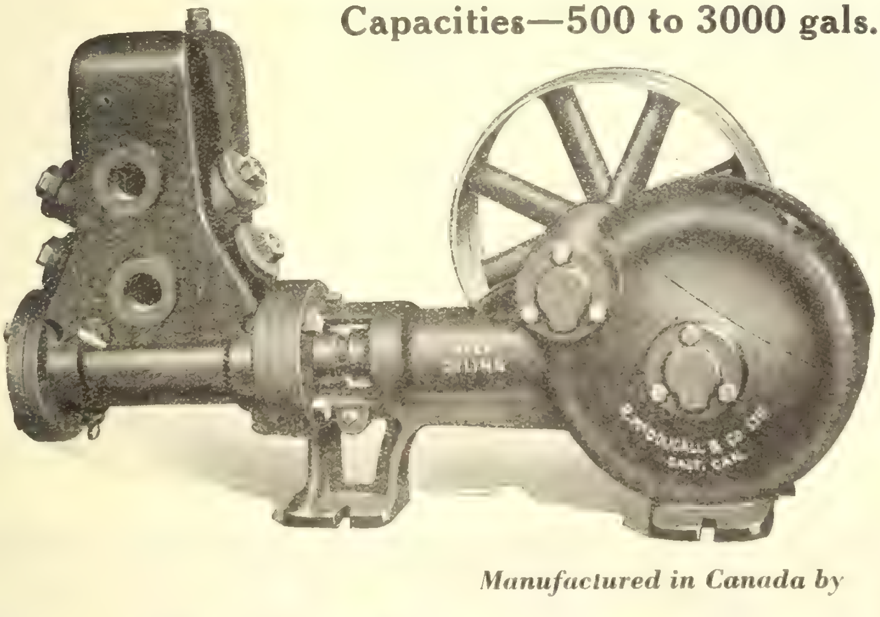

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Conferences of Road Foremen Make for Better Highways

About a year ago comment was made in this column on the inauguration of a road foreman's conference in Victoria County, Ont., under the direction of E. L. Miles, county engineer. An innovation in road building organization, this gathering was instrumental in giving those who attended a clearer conception of thelr responsibilities and a better idea of how to attack the problems which they met. In Ontario county, shortly afterwards, a similar conference under D. J. Kean, the county engineer, confirmed the success of the plan and established a better co-operative spirit in the highway organization of that particular county. In commenting on these meetings, we stressed the advantages which these compact and intimate gatherings had and ventured to predict good results from them. A year's experience has not shown that anything that was to be expected failed to materialize or that the trouble of arranging the conferences was not worth while.

The spirit of the scheme has apparently caught on, for we learn now that in Malahide township, in the county of Elgin, Ont., the road foremen convened for the purpose of discussing their mutual problems and responsibilities. In this case, the plan has developed to a further stage than when first inaugurated, for it embraced in this instance a township instead of a county. By so doing, the local peculiarities of the highway problem received the intimate attention that could not be obtained through the more unwieldy provincial and national meetings. In this respect, the county and township conferences are certainly superior to the larger gatherings in which the elements of personal contact and intimacy of discussion are sometimes entirely lacking.

At the meeting of the Malahide foremen, the enthusiasm for the scheme ran so high that it was decided to make the meeting an annual affair. In this way being held just before active road building commences, it will serve as an inspiration and incentive to the whole road building organization. It is an innovation that will certainly bear repetition by every county and township in the country.

Reports of Contemplated Construction Continue to Break all Records

Every indication points to 1923 being the greatest of building years since the boom days of 1912 and 1913, according to MacLean Building Reports, Ltd. Contemplated work reported during April, indicates a tremendous volume of new construction in prospect. The Dominion total for the first four months of 1922 amounts to $164,198,200, compared with $102,603,500 a year ago, an increase of 60 per cent.

What proportion of this great volume of projected building will be proceeded with? MacLean Building Reports say that the index of building costs continue to rise, and it would seem as though large building investors had determined to go ahead with construction in spite of increased cost. It is a gratifying fact that the established policy of manufacturers in the building field is to co-operate with buyers. Labor, as always, is subject to the basic control of supply and demand. In several of the trades shortage is anticipated. It is probable, however, that the average cost of labor will continue approximately on the basis of labor costs as in the spring of 1922, with some increases.

It is clear that the demand for labor and material will be very great this year. The steel industry is sold up for four or five months ahead. Lumber stocks are not large. Under such conditions reductions in prices cannot be expected. The consensus of opinion is that construction is as cheap to-day as it will be at any time during the next two or three [illegible] who are growing [illegible] building would bet[illegible] than to wait until later.

[illegible] April construction contracts actually [illegible] amounted to $30,843,800, compar[illegible] in March, and $29,428,400 in April. [illegible]ential building accounted for $38.2% of [illegible]l, and amounted to $11,772,100. Busi[illegible] amounted to $9,324,900, or 30.2%; [illegible] building, [illegible], or 3.8%; public works [illegible] or 2.8%.

Canadian Good Roads Assn. Plan for Important Convention

[illegible] by the Federal Government of its attitude regarding federal aid in highway con[illegible] to the extent of providing for an exten[illegible] years of the time within which the various provinces may earn and be paid the sums allott[illegible] the Federal Highway Act, will give to the delegates attending the tenth annual convention of the Canadian Good Roads Association on June 11, [illegible]2, 13, and 14 next at Hamilton an opportunity to discuss fully the question of federal aid. Despite the attitude taken by the Government, all the pro[illegible]s are unitedly in favor of it, and one of the sub[illegible] on the tentative programme of the convention which has just been prepared by the executive is entitled "Who shall pay for roads?" This discussion will not only embrace suggestions for the equitable distribution of the cost but also the question of federal participation in highway construction. The result will probably be that some strong action will be taken to support those who are fighting for a new grant from the Dominion treasury.

Maintenance Emphasized

The tentative program that has been prepared for the convention indicates that while every phase of highway construction is covered, emphasis is being laid this year on the problem of maintenance, this being a matter that has had to be seriously studied by the provincial government, who have found that heavy expenditures in construction are being lost through lack of proper maintenance. The subject will be divided into two heads one dealing with permanent types of roads, with which will be associated cost data that will be invaluable for reference purposes and the other with the best methods of maintaining roads, particularly earth and gravel roads. The latter types will be very numerous in the Dominion for many years to come, and methods for maintaining them in an efficient state are eagerly being sought by municipal engineers and councils. The best methods of conducting a patrol system will also be discussed in conjunction with these papers. The slogan of the convention will be "Adequate maintenance means road economy." It is an indication of the rapid growth of good roads in all parts of the Dominion that many of the delegates from the Maritime Provinces, Quebec and Ontario, as well as from the United States will go to Hamilton by automobile—something that would not have been possible a few years ago. These delegates will [illegible]ularly interested in the papers on the prol[illegible] of the highway, which will be dealt with under various sub-sections. Proper use as well as proper construction are the essential factors in the economic value of our highways, and the convention will discuss use from the angles of the autobus, the motor truck, the proper regulation and enforcement of laws, as well as hear about illuminated, and non-illuminated danger signals, and uniform hand signals.

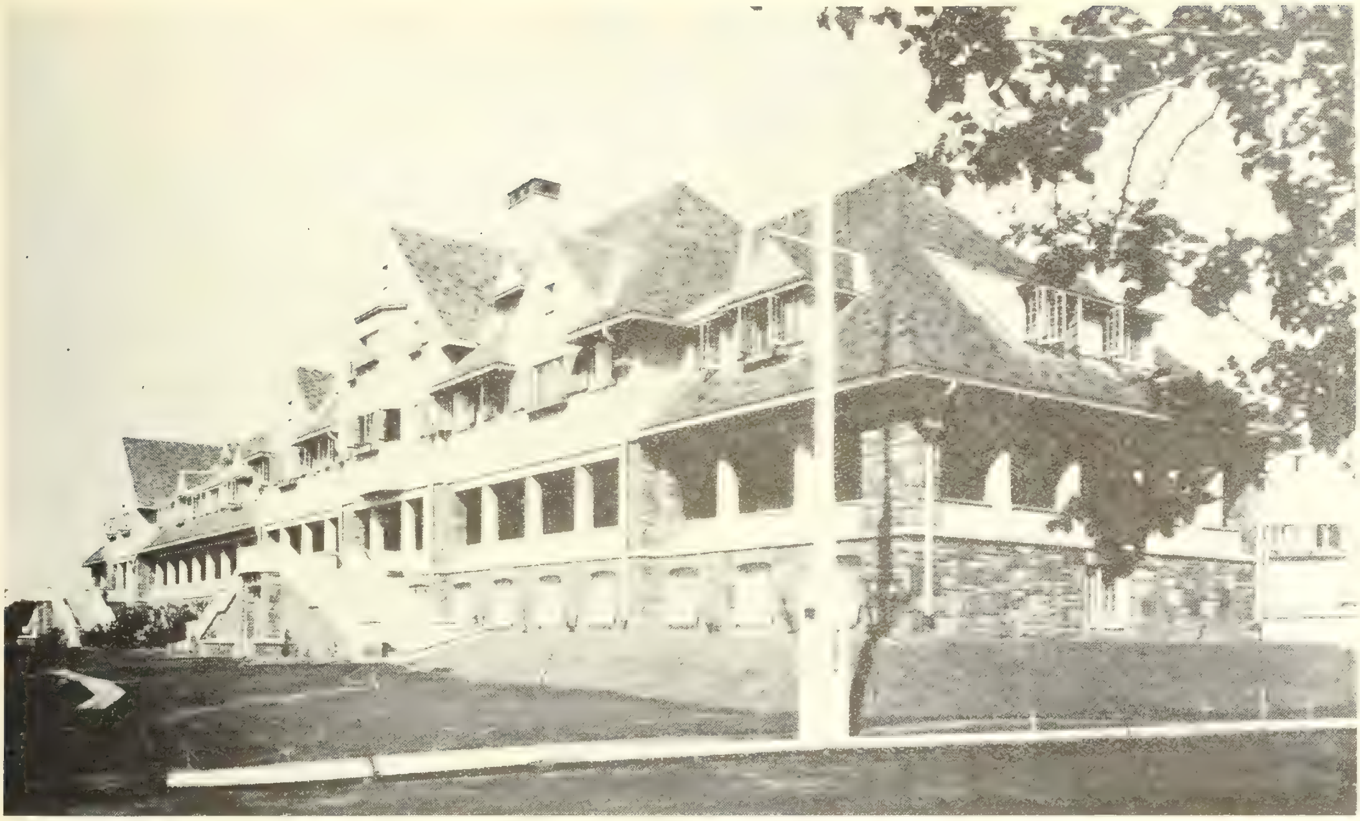
Tourist traffic will be another subject down for discussion, as well as the utility of single track cement concrete roads, bituminous surfaces, methods for reconstructing old macadam roads, the merits of metal and other types of culverts; the use of refined tar in road construction and maintenance; together with a talk on contractors and their worries. The different provincial highway systems will be dealt with by representatives of the respective provinces, who will speak of the permanent types of roads constructed, and the manner in which they have stood up under modern traffic. In this connection valuable information will be submitted to the convention by officials of the U. S. Government, who have been carrying out tests of all kinds of roads under all sorts of conditions, gathering data which will be of great importance to all highway authorities. These facts will be laid before the delegates in the shape of illustrated lectures.

Trips of Inspection

Owing to the lateness of the season it is likely that the delegates to the convention will arrive in the Niagara district on Blossom Sunday, and if so they will see a wonderful picturesque sight through the famous fruit district. Two official drives will be undertaken during the convention to give the delegates an opportunity of inspecting various types of roadway. On the Monday afternoon a drive of sixty miles will embrace Galt, Guelph, and Kitchener and will cover roads of cement concrete, heavy bituminous construction, graded gravel and asphaltic concrete. On the Thursday afternoon the drive will be to Niagara Falls, Queenston and Brock's Monument, the delegates not only being able to inspect a seven years old penetration asphaltic concrete, in addition to other types of pavement including cement on grade, and some very fine gravel roads, but will also see the great hydro development in that district. Cars will be provided for all delegates and their wives and a ladies committee, which is already at work is in addition preparing a round of entertainments for the ladies who accompany the delegates to Hamilton.

The annual dinner will be held at the Royal Connaught Hotel, the headquarters of the convention, on Wednesday evening. The Lieutenant Governor of Ontario, the Hon. Harry Cockshutt, has been invited by the president of the Canadian Good Roads Association, the Hon J. L. Perron, to formally open the convention on June 11 and a distinguished list of guests are also being invited. The Engineering Bureau of Standards, who have appointed several sub-committees in connection with the standardizing of traffic signals on highways will probably hold their next conference at Hamilton at the same time as the convention.

Report number 7 of the Scientific and Industrial Research Council of the Province of Alberta is entitled "An Occurrence of Iron on Lake Athabaska." The authors are John A. Allan, professor of geology, and Alan E. Cameron, associate professor of mining engineering, University of Alberta, Edmonton.



The club house of the Royal Montreal Golf Club

Royal Montreal Golf Club is Important from a Construction Viewpoint

Recently Completed Club House at Dixie, P. Q., Embraces Many Interesting Architectural and Contracting Features—Detailed Description of an Imposing Building

A contract of considerable interest which has recently been completed is the construction of the new Club House for The Royal Montreal Golf Club at Dixie, P.Q. The work was carried out by E. G. M. Cape & Company, under the direction of Saxe & Miller, architects, Montreal.

The Royal Montreal Golf Club is famous in many ways, and more especially so owing to the fact that it is the oldest golf club in America, having been founded in 1873 with a membership of fifteen who played enthusiastically with ever increasing membership on what is now known as Fletchers' Field on the lower slopes of Mount Royal. The club, which in 1884 obtained the permission of the late Queen Victoria to use the prefix "Royal," has done a great deal towards the development of the game in Canada and the United States.

During the summer of 1875 a number of enthusiasts met in Quebec and organized the Quebec Golf Club. Naturally, the business rivalry of the two cities spread to golf, with the result that, following an invitation, a team from the ancient capital repaired to Montreal in May 1876, and played the first of a series of intercity matches, the continuity of which has been unbroken save during the war years, after which they were resumed with the expectation that they will continue as long as the two clubs remain in existence. The first match in Montreal was won by the visitors, but when Montreal visited the Cove Fields, the result was reversed.

Owing to the growth of the city of Montreal and increasing membership, it was found necessary to seek a new location for the club where more extensive links could be built. After several years' search, it was decided to buy property at Dixie, this location being ideal owing to the proximity to the city, its situation on beautiful Lake St. Louis, and the suitability of the land for a golf links. In 1897 the club moved to Dixie where a wooden club house was erected; this building being added to from time to time, and the links extended as required.

Extension of the Course

In 1918 it was found that owing to increase in membership and the enthusiasm of the players, the links were very much over-crowded. This meant that it would be necessary to increase the playing accommodation, to do which meant providing a second course of eighteen holes. At the same time it was decided to lengthen the existing course so that it would be of championship length. The adjoining farms to the north and west were purchased, and Willie Park, the great authority on golf architecture, was engaged to design the two complete courses of eighteen holes each. This he did by laying out twenty new holes and using sixteen holes of the original course. The results have been most satisfactory in that the course is now much more interesting, there is no crowding on the links, and the greatest advantage of all is in the fact that the game becomes so much more interesting with the variation of holes which are obtained by playing on the different courses. Both courses are of championship length, and although not at all alike are equally difficult, thus offering a variety to the members which ordinarily can only be obtained by belonging to two different clubs.

Before embarking on the extension of the links, the committee under the able leadership of Mr. W. R. Baker, C.V.O., the president, made all the necessary arrangements, financial and otherwise, for building a new club house in keeping with the extensive programme for the links. A competition was held, open to architects who were members of the club, and three sets of plans were submitted. There were so many good features in each scheme that the committee had great difficulty in making a decision. To assist in the matter, Mr. Darling of Darling & Pearson, architects, Toronto, was asked for an opinion. He agreed with the committee that the work should be awarded to Saxe & Miller, who were accordingly instructed to call for tenders. This was very soon done, and the contract awarded to E. G. M. Cape & Company. Work was commenced in July 1921, and the official opening took place May 25, 1922, coincident with the celebration of the 70th birthday of the honorary-president Mr. W. R. Baker, C.V.O., to whose efforts the success of the whole scheme was so largely due.

New Club House and Station

It was decided to locate the new club house immediately in rear of the existing club house in order that the members should not be disturbed during the golfing season. Once the location of the building was settled, work was started on a new road running from the station road to the main entrance of the new club house. This greatly improved the links as the old road, which ran across one hole and the full length of two holes, was done away with. Another great improvement was the new station built by the Grand Trunk Railway System. This station is about three hundred yards from the club house and is connected by a good concrete sidewalk. The Grand Trunk Railway System were most considerate in that they built the station of the same materials as the club house and the same type of architecture so that the whole blends together beautifully. They also improved the surroundings of the station with terraces and gardens with a most pleasing result.

A railway siding with a capacity of six cars was installed at the building by the Grand Trunk Railway System for the assistance of the contractor in carrying out his work, and during the course of construction 123 cars were unloaded from this siding.

The new club house was kept as high as possible above the surrounding land for two reasons, first to give a good view of Lake St. Louis, which is about one quarter of a mile distant, and secondly to give light and air to the locker rooms which are situated at the ground level.

The excavation for basement and foundations was carried out with horse-drawn scrapers, and surplus material wasted in terraces around the building. These terraces are to be planted with shrubs, flowers and vines, adding greatly to the appearance of the building.

Masonry is a Feature

All footings, foundations, and basement walls below grade are of concrete, the footings under steel columns being reinforced. From grade to first floor level the walls are built of solid stone masonry. This masonry is quite one of the features of the building; the stone is uncut and laid in random sizes as received from the quarry. The stone, which comes from a quarry near Beauharnois, P.Q., is particularly suited for work of this kind owing to the natural beds being parallel and the stone breaking always with rectangular corners. Also the colours of various shades of yellow, brown, grey and blue give a variety to the finished work which is further emphasized by the random size of stones used. In this connection it should be noted that this stone is very hard and difficult to work, the labour of laying being out of all proportion to the cost of the material.

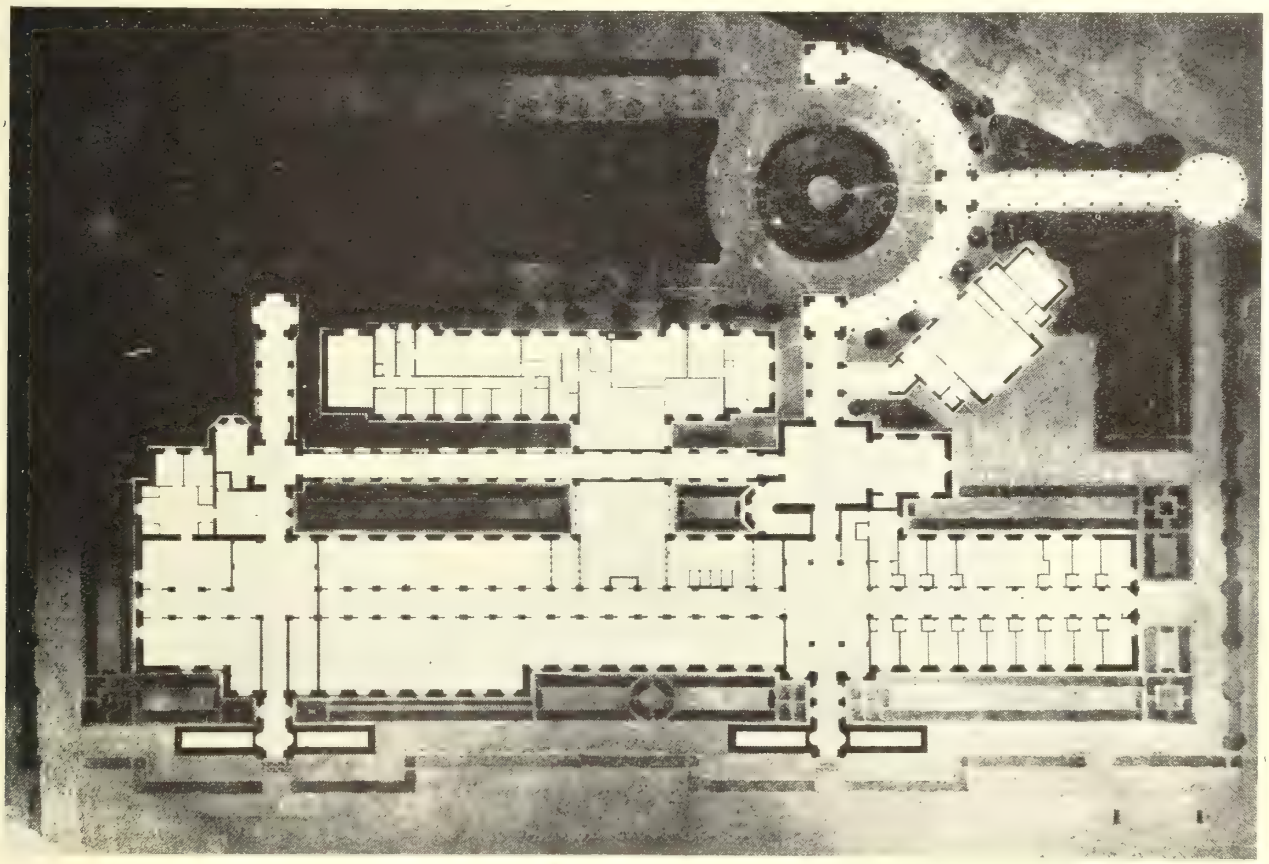
The general scheme of construction is a steel frame of columns and beams with a reinforced slab forming the first floor and verandah; the second floor is wood joist construction of 2″ x 10″ joists at 20″ centres, spanning 9′0″ from beam to beam. The top floor and roof are wood framing of the usual character for a building of this type with sloping roofs and dormers. It can easily be seen from the photograph and plans that the framing of this roof was not an easy piece of work, firstly because of the many ridges in different directions and at varying heights, and secondly the many dormer windows of various sizes and types which were required to be framed in with the rafters. The whole of the roof was double boarded with two plies of tarred felt and an air space of one inch between the boards.

Special Slate Roof

The contract for roofing and sheet metal was carried out by McFarlane-Douglas Co. Limited with fading green slate as supplied by Rising & Nelson Slate Company of West Pawlet, Vermont. The slate used is of random lengths and widths and has about 12% of purple slates; it is described by the manufacturers as a combination of shades from seven to twelve inclusive, specially selected from a deep bed quarry. The advantage of this slate over the non-fading green slate is, firstly, that it is less expensive; and, secondly, that it very soon weathers to a blend of different shades of green, grey, purple and mauve giving a softer appearance and doing away with the shiny new look which many slates have, and so helping to tone down the whole building. In a building of this type where the whole of the roof is exposed to view too much care cannot be taken in the selection of a roofing material, and in this case people are unanimous in agreeing that the architects have chosen exactly the right material.

The exterior of the building from the top of masonry walls to eaves is covered with a rough-cast stucco. This is of cement plaster on which has been cast screenings from crushed stone mixed with cement, these screenings being of Montreal limestone of a size passing through a one-quarter inch mesh. The difficulty in carrying out this work is to disguise the junction between the different days work. This can only be done by arranging to finish each day's work at some corner or break in the building, and considerable forethought is required to arrive at this result. On completion of the building the stucco was painted with two coats of "Cemtex," a yellow ochre colour being chosen. The painting was done by means of a gasoline machine which squirted the paint from a hose through a patent sprayer. This method was effective and economical, as one man on a ladder and a man to run the machine on the ground were able to cover a large area each day.

From the ground floor plan may be seen the sidewalk and roadway leading up to two entrance towers which have an archway between forming a very effective entrance to the parking space for motors. The two ends of this parking space are defined by semicircular pergolas of artistic design. The floors of pergolas are of brick laid on edge with cement margins. Roughcast circular columns support the roof which is framed of rough sawn timbers and boarding which have been stained and left exposed to view. Pavilions with heavy masonry piers at each corner form the ends of pergolas.



Ground floor plan of the Royal Montreal Golf Club

The main entrance hall is reached through a well-lighted vestibule with tile floor and Caen stone walls. The entrance hall is a very striking feature of the building, 23′ x 23′ x 37′ high inside, finished in Gothic style, the ceiling being of chestnut boarding with exposed rafters, ribs and carved gargoyles. The walls have chestnut panelling 9′0″ high and concealed radiators; above this panelling is Caen stone plaster with long narrow Gothic windows glazed with leaded glass. To one side is the secretary's office with counter, grill and doors worked into the panelling of the hall. The office has a tile floor and base with Caen stone walls, well lighted with windows in the thick masonry walls, and has a spacious vault built to one side of the office.

Ground Floor

The locker rooms cover an area of 45′ x 265′4″ and provide 150 lockers for the ladies and 575 lockers for the men. This, with the bedrooms and dressing rooms on the second floor provides ample accommodation for all the members.

The men have 11 showers, 5 W. C's, 5 urinals, and 8 washbasins; and the ladies have 3 showers, 2 W. C's, and 3 washbasins. This is all exclusive of installations on the first and second floors.

The men's locker room hall, which has a tile floor and base with Caen stone dado and plaster beamed ceiling with plaster ornamentations, is furnished with racks in which to leave clubs after playing, and also a few tables and chairs where a quick refresher may be obtained. The locker rooms are cleverly divided off into cubicles, each containing about fourteen lockers. The lockers, themselves, form the divisions between the cubicles; the privacy is obtained by small double-acting glazed doors at the end of each bay. There is a window in each cubicle and also a long wide bench with rack underneath for boots; a mirror, hairbrush, etc., is also furnished. The most striking feature of the locker rooms is the light and ventilation, which is due to the size and number of windows and also to the fact that the room is not below ground level. The lockers are 24′ wide and 6′-0″ in height and 15″ deep, specially designed by the architect. They are completely of metal, painted a cream [illegible] grained, and fitted with shelf, hat-rack, umbrella and club rack, hooks for clothes, and an opening top furnished with metal coat hangers. The doors are in pairs with fixed louvres and master-keyed lock, metal number plate, and card rack for name of occupant.

The showers are arranged with a dressing cubicle on each side, the floor of which is 1" above the floor of shower and also above the general floor level of the room. The partitions of all showers and cubicles are of marble, and the walls around each are lined with marble. Mixing valves for showers which regulate exactly the desired temperature of water are placed on the wall opposite the shower head so that the water may be turned on and off without getting under the shower. The locker-keeper is provided with a special room equipped with a sink and shelves on which to keep surplus supplies of towels, etc. Next to this is the drying room, which is used for drying members' clothes after playing in a rainstorm. This room is very highly heated with a duct to the outside to carry off the moisture.

The ladies' locker room is laid out in a manner similar to the men's. The entrance is through a vestibule the same as for the men, and the entrance hall is the same except that it is on a smaller scale. The two entrance halls are connected by a long well-lighted corridor with chestnut beamed ceiling, tile floor and base, and Caen stone walls; each of the many windows has a flower box on the inside with chestnut legs, and front set into the window embrasure which has been specially formed by building out of each window.

First Floor

The first floor is reached from the entrance hall by a flight of radiating stone steps which lead up through a large staircase with Caen stone groined ceiling and walls, and Gothic windows with leaded glass and tile sills. At the head of these stairs, looking out into the main entrance hall, is a balcony which adds greatly to the architecture of the hall, and at the same time gives an air of spaciousness to the building.

The men's grill and lounge is the most striking room in the building. It is 80' long by 24' wide with a large bay window and well lighted along both sides. The floor and base are of tile, and the walls have chestnut panelling up to the ceiling. The mantel to the ample fireplace is very simple and a continuation of the panelling. The ceiling is very impressive, it is arched to a barrel shape and cut into panels with a flat plaster ornamentation. The finish is an old ivory effect, obtained by shellac rubbed down with wax.

The billiard room which opens off the lounge is treated in the same way except that the ceiling is flat, and a seat on a platform is provided for the spectators. Along one end the panelling is formed into small cupboards in which to keep the cues. Above this is a mural painting 12'0" long which illustrates the different phases of the development of the game of golf. At the east end of this floor is the writing room, which is very attractive, well lighted with windows on three sides and a large bay window. It is so located that it is cut off from the other rooms by a corridor and consequently is always quiet. The fireplace has a tile breast and the walls chestnut panelling, the ceiling is flat with a splay around the walls and plaster ornamentation running around the splay.

Off the grill room is a stair running down to the locker room and up to the bedrooms and connecting on this floor with telephone booth, coat room and lavatory. In the centre of this floor between the dining room and grill is located the bar, which has two service wickets to the grill, one to the service to the dining room and one to the lobby for service to the gallery. Ample space is provided for all requirements; and the fittings of chestnut are most complete, including shelves for bottles, a hoist from the cellar, dumb-waiter upstairs and down, sinks, bins, refrigerators, etc.

The dining room, which is for ladies, and men dining with ladies, is 53' x 24' with windows along both sides and two bay windows to the gallery. The walls are of Caen stone with the fireplace mantel carried out in ornamental Caen stone. The ceiling which is high has wood beams of chestnut with wood brackets at the wall under main beams. All wood floors on this floor are of selected red birch, one and three-quarters inches wide.

The common lounge is treated in the same way as the dining room, the woodwork in both being in chestnut. Over the mantelpiece in the former is a cast plaque of Miss Cecil Leitch, the famous lady golfer, in the act of playing a stroke. This plaque is of Caen stone and is set in the Caen stone breast above the fireplace, which affords an excellent setting.

The ladies' sitting room is finished in whitewood, with wood mouldings forming panels on the plaster walls and above the fireplace. All woodwork and plaster is painted white enamel with a flat finish. The ladies end of this floor is reached by a flight of stone steps from the entrance hall, and these stairs continue on up in wood to the bedroom floor.

The gallery extending the whole length of the front of the building and across both ends is 319 feet long and 15 feet wide. There are doors to the gallery from the lounge, bar, dining room, common lounge and ladies' sitting room. The floor and base are tile, and the posts and railing of stucco with cement cap and base. The main piers of stone masonry together with the posts carry the roof, which is the underside of the bedroom floor above. This ceiling is plastered in cement plaster with a sand finish, and tinted to match the stucco. At each end of the gallery is a double flight of stone steps with stucco railing the same as on the gallery; these stairs lead down to the links, and underneath are porch and doors leading direct to the ladies' and men's locker rooms respectively.

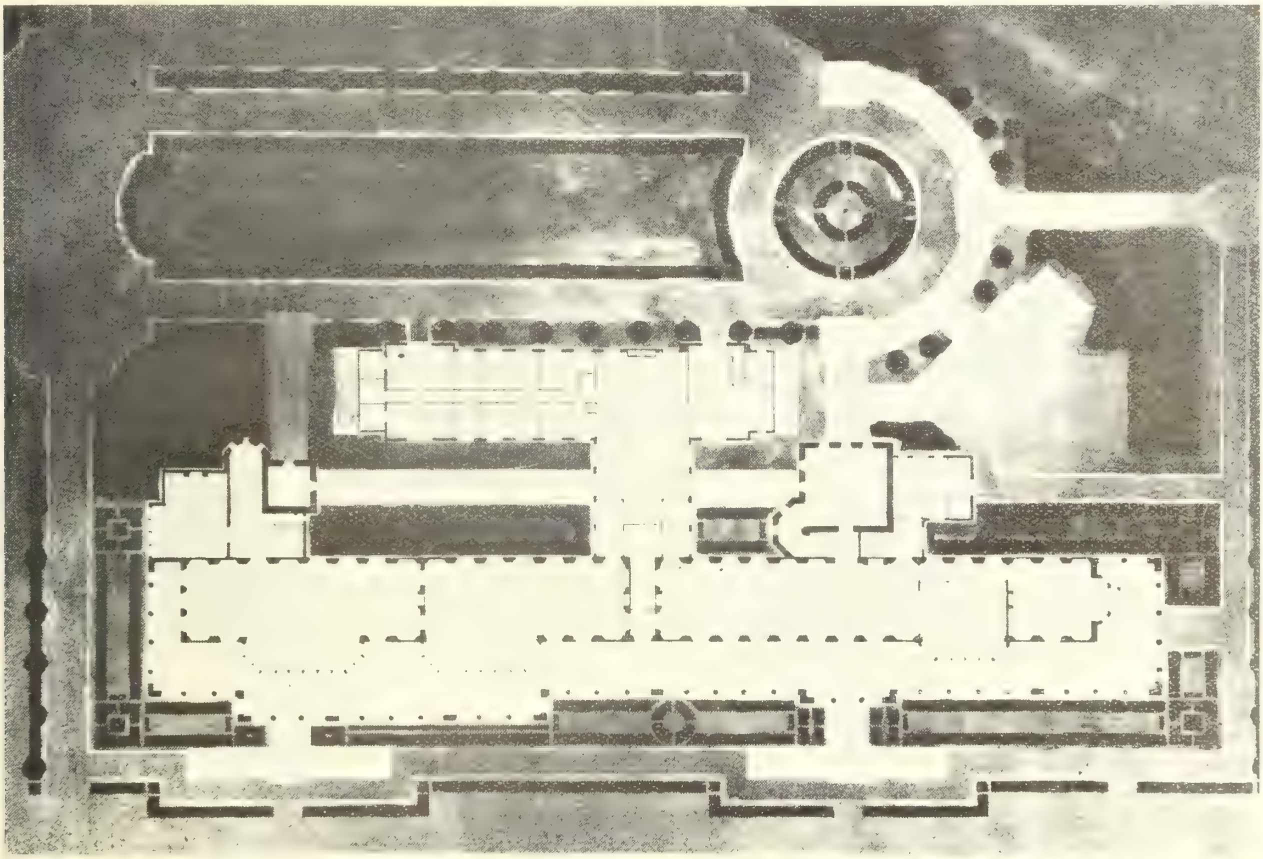
Second Floor

The second floor is devoted to bedrooms and dressing rooms for the members. It is divided the full length by a corridor 295 feet long to the south of which facing the links and the lake are the bedrooms; on the opposite side are the dressing rooms. There are twenty-seven bedrooms, each of which is supplied with running water and a large clothes cupboard; as well as the handbasins there are five bathrooms, each shared by two bedrooms. Each bedroom is equipped with two doors, the outer of which is a lattice door to give a free circulation of air in the hot weather and at the same time giving the occupants full privacy. There are twenty-six dressing rooms with accommodation for three members in each. On this floor there are three shower rooms and one bathroom in which are the following fixtures: 1 bath, 7 W.C.'s, 6 showers, and 8 washbasins. This, together with the private bathrooms, is ample accommodation. Linen cupboards, service room, telephone booth and card room are also provided; the latter has a nice fireplace with wood mantel, a bay window and ornamental plaster beams on the ceiling.

Service Wing

The service wing, which is self-contained with light on all sides except where it joins the main building, is located in the rear. The basement contains the coal bunkers, boiler rooms and the wine cellar. This latter which is insulated with terra cotta furrings plastered with cement plaster, has its own entrance from the rear, reached by a sloping reinforced concrete runway with pipe handrail. An electric hoist connects with the bar two stories above. On the ground floor are located four bedrooms for the male staff, chauffeurs' room, dining room, lavatory, bathroom, laundry and ice plant. The laundry is equipped with all the latest machinery to make the work economical and easy. The ice plant has not yet been installed.

On the first floor is the kitchen, the main room of which is 42' x 26' with cement floor and good light and ventilation. The equipment is of the most modern, including steam tables, vegetable steamers, soup boiler, dish washers, coffee urn, tea urn, etc. Storerooms, refrigerators and bake shop are also on this floor; the latter being equipped with an electric oven. The housekeeper has her office here, and also the maids' dining room.


First floor plan

On the second floor are the housekeeper's rooms consisting of a sitting room with fireplace, bedroom and private bathroom. There are also eleven maids' bedrooms and bathroom.

On the top floor there are eight additional maids' bedrooms with bathroom.

Professional's Quarters

The professional's shop, which is a very spacious and cleverly laid out building standing by itself near the front entrance and connected to the entrance vestibule by a corridor, has its own entrance by which members come in on their way to the locker room to make arrangements for caddies and lessons, and to buy balls, clubs, etc.

The public space and corridor have tile floors and Caen stone walls. A showcase for clubs, etc., on sale, faces the entrance door set on a brass topped counter; behind this are the racks in which are kept the members' bags of clubs; to one side is another small counter where balls may be purchased and marked with the full name of the purchaser, and behind this is the room in which the clubs are cleaned—equipped with two electric buffers for this purpose. The caddy master's office is to one side of the counter and is so arranged that all caddies applying for work must pass through the office and register on their way to the play ground. The caddies are confined to the play ground by a stucco fence, and an artistic shelter with benches and lavatory is provided for their accommodation. The upstairs of the shop is devoted to girls' lavatories, workshop, showroom and one bedroom with shower for visiting professionals.

General Type of Finish Throughout Building

All tiles used for floors and base were supplied and laid by the James Walker Hardware Company, and are known as Welsh heatherbrown quarry tile. These are specially suitable for this work where such large areas are covered, owing to the slight variations in colour which break the monotony over an expanse; also they do not have a highly glazed look and do not appear shiny. All wood work on the first floor, which is the main floor, is chestnut, finished medium dark with wax and rubbed to a medium high finish, i.e., not very glossy. The panelling, which in many rooms as previously described, is nine feet high adds greatly to the richness of the general appearance. Throughout this floor all radiators are concealed under chestnut window seats with heat grilles on the top. Approximately three thousand square yards of plastering was carried out in French Caen stone, laid out in joints pointed white. A large part of the ornamentation was done in a similar manner. This plaster which has a brownish yellow color and a texture like sandstone gives an air of solidity and antiquity wherever used. In the main entrance hall a large panel was formed in which it is proposed to set a memorial tablet inscribed with the names of members who served in the great war. All windows and doors are equipped with metal weatherstripping, and also with fly screens. The latter are hinged to a small frame which is removed with the screen, thus adding considerably to the strength. There are two hoists in the building, one electrical from the wine cellar to the bar, and one hand power from the service entrance down to the basement and up to the kitchen, and also up to the bedroom floor for trunks and furniture. There are also two dumb-waiters, one from the bar down to the locker room and up to the bedroom floor, and the other from the kitchen down to the chauffeurs' dining room.

Electrical Equipment

The electrical work was installed under the direction of Alexander Wilson, consulting engineer, Montreal, who gives the following brief description of the installation:

Supply:—Electric energy for the supply of light and power in the club house is obtained from the town of Dorval, energy being supplied at 2,200 volts, 3 phase 60 cycles. It was necessary for the club to connect with the Dorval system at a point on the main road some 600 yards below the club house and in order to avoid an unsightly pole line running through the links two underground cables were installed connecting with the 2200 volt system and leading to a small transformer house located at the rear of the club house.

The two primary cables consist of No. 6 three-conductor, 2,500 volt, paper insulated, lead covered, double steel tape armoured cable.

In the transformer house are installed one 40 k.w. 2,200/220/110 volt, single phase transformer for lighting service to the club house and two 5 k.w. 2,200/550 volt, single phase transformers connected in open delta for the supply of power to small motor driven equipment.

Secondary cables connect the transformers underground with a small distributing switch board located in the basement of the club house close to the boiler room and from this point the 220/110 volt 3 wire lighting service and 550 volt three phase power service is distributed.

Distributing Switch Board—The distributing switch board consists of a black slate panel equipped with knife switches. All switches have fuses of the cartridge type. Space is also provided on this panel for metering equipment.

Wiring—Wiring is of the concealed knob and tube type installed in strict accordance with the Canadian Fire Underwriters' Association requirements. Outlet and junction boxes are of pressed steel well galvanized inside and out to prevent oxidation. Panel cabinets are of the 3-wire type and arranged for flush mounting. In all there are eleven panel cabinets distributed throughout the club house. An outlet box is also provided at the front of the club house for taking care of lighting for bowling greens, etc.

Telephones

Telephones connected with the Bell Telephone Company's system are installed in proximity to the principal club rooms and these individual phones are controlled through a small switch board in the secretary's office. There are two lines connected direct to the city exchange so that Montreal can be reached without delay, and also one line to the Lachine exchange for local calls. There is also a system of interphones throughout the various offices of the building used almost entirely by the staff for the transmission of orders, etc.

A view along the verandah

Miscellaneous equipment consists of small motor driven apparatus for laundry machines, buffer motors, etc. These are all connected on the 220 volt supply as well as 7 k.w. heating oven, 3 k.w. toaster; 3 k.w. mangle, electric iron, etc., etc.

Heating, Ventilating and Plumbing

The heating, ventilating and plumbing work was installed under the direction of McDougal, Pease and Friedman consulting engineers, Montreal, who give the following brief description of the installation:

The club house is heated by means of a low pressure system. Thermostatic valves are installed on the returns of all radiators and the condensation is returned to the boiler by gravity or by means of a motor driven vacuum pump.

There are about 160 radiators containing approximately 12,000 square feet of radiation in the building. Only certain of the bedrooms on the second floor have radiators in at the present time. Connections are left, however, for future installation. The top floor is not heated. The locker rooms have sufficient radiation to heat same until December 1st. The other rooms (containing radiators) have sufficient radiation to heat same to 70 degrees with 20 degrees below zero outside.

Steam originates from the two 85 h.p. Victory water-tube heating boilers. The condensation from the radiators can either be returned to the vacuum pump and thence to an air separating tank before entering the boilers or direct to the air separating tank by gravity without going to the vacuum pump. The highest point at which the air separating tank could be located above the water line of the boilers is about three feet. This means that whenever the pressure in the boiler runs above one and one-half pounds the water will not flow from the tank to the boilers by gravity. When this is the case it is necessary to run the vacuum pump, which also acts as a boiler feed pump. The air separating tank has an automatic air valve that is controlled by means of a float in the tank so that when the pressure on the boilers is above one and one-half pounds and the vacuum pump is running, the water accumulates in the tank and closes the air valve by means of the float and is forced back into the boilers.

The system has been run on practically one to one and one-half pounds pressure during most of the severe weather during this winter and the vacuum pump has only been run for about fifteen minutes to one half hour, when the system is first started up.

Steam is supplied to the kitchen and laundry equipment from a 40 h.p. vertical tubular boiler run at 40 lbs. pressure. Condensation is returned to this boiler by means of Crane lifting and direct return traps.

There are two hot water service heaters, one takes care of the hot water requirements for the kitchen and laundry and the other furnishes water to the showers and lavatories.

The kitchen is ventilated by means of an exhaust fan located in roof space.

The existing sewer from the old club house was found too small for the requirements of the new building. It was therefore, necessary to install a new 9 in. sewer connecting with the main drain in the public highway. This necessitated the digging of a trench 1,400 feet long. A steam shovel was employed and the work very quickly completed.

On Oct. 22, 1921, the corner stone was laid by Mr. W. R. Baker, C.V.O., the honorary president, in the presence of a large and fashionable gathering. The various committees were present at the ceremony and an interesting address covering briefly the history of the Club was given by Mr. J. J. McGill, the president.

The stone contains, besides the names of the officers , the following articles: A list of the present members of all classes; book of by-laws, past and present; history of the club; photographs of honorary-president, president, directors, chairman of beautifying committee, construction committee with architects and contractors and original and present clubhouses. Copies of Montreal newspapers were also deposited in the hollow, coins and stamps of the present day, a photograph of the prince of Wales teeing off on the Royal Montreal Dixie course of 1919 while on a visit to this country, golf balls, fixture cards and an invitation to the ceremony.

On completion of the building, the work was inspected by Mr. Darling who had judged the awarding of the architectural competition, who expressed himself as very pleased with everything.

When war was declared and Canada threw in her lot, members of the Royal Montreal Golf Club promptly enrolled for service. The roll of honor shaws that 135 served and that 20 members and 18 sons of members paid the great sacrifice.

Whether on the mountain side or at Dixie the records of the club has been one of progress, and throughout the years the membership list reveals the names of leaders in industry and commerce, in banking, the Bench, the Bar, in education and the church. In brief, it has been representative of the best in Montreal. .

Elasticity and Strength of Materials

A useful book on the subject "Elasticity and Strength of Materials Used in Engineering Construction" has recently been published by C. A. P. Turner, consulting engineer, Minneapolis and Winnipeg; price $5.00. It contains six chapters which treat the various phases under the following headings: Chapter one: stress, stress resistance, combination and separation; two: external forces and elastic resistance; three: mechanics of elasticity; four: materials of construction; five: range of imperfect elasticity within the yield point, endurance tests and work of rupture; six: working stresses deduced.

The Progress of Industrial Research

What Canada has accomplished in the way of scientific and industrial research is covered in a 168-page book just issued by the Canadian Manufacturers Association. The book contains the addresses delivered at the National Research Conference held under the auspices of the Association at Ottawa on February 20-22 and includes statements by the representatives of government departments, universities, colleges, industries and others engaged in research work. As a record and summary of the progress of scientific and industrial research in Canada, the publication will be found of considerable value.

Metal Lath Standardization

Reduction from more than 80 varieties of expanded flat metal lath to 10 and for more than 70 varieties of ⅜ in. expanded rib lath to only 7 was recommended recently at a conference of metal lath manufacturers, users and distributors held at the Department of Commerce under the auspices of the Division of Simplified Practice.

Chilled Iron Car Wheels

The Engineering Experiment Station of the University of Illinois has issued in Bulletin No. 135 a discussion of the properties of chilled iron car wheels with particular reference to strains due to brake application, coefficient of friction and brake shoe wear. This bulletin is the third report issued by the Station on these car wheel investigations.

Detroit will be the location of the 43rd annual convention of the American Water Works Association which will be held at the Statler hotel on May 21 to 25.

"Watch Canada," Says Babson, "Her Condition is Exceptionally Favorable"

Canada Sound, Babson Avers

Roger W. Babson has returned from his annual inspection trip. In reviewing the trip in general, Babson stated that if anything, business is becoming too rapidly active in the United States.

"Everywhere people are talking prosperity, building is booming; prices are again advancing and wages are rising," says the statistician. "A little of this is a good thing but too much of it all at once is dangerous. When a patient recovers too rapidly, a relapse may occur. The business men of the United States need to remember the warning of that old capitalist and philosophor—King Solomon—who cautioned the business men of Jerusalem that 'pride goeth before destruction and a haughty spirit before a fall.' Personally, I much prefer the more gradual and deliberate manner by which Canada is passing through her readjustment. We have much to learn from our northern neighbor. Today conditions are better in the States; but unless we take care, business will be better in Canada in 1924 than it will be here.

Improvement in Canada is Imminent

"I spent some two weeks of my trip studying Canadian conditions," continued Babson, "and was very much pleased with what I found. Various factors suggest that the Dominion stands in about the same position in the economic cycle occupied by the United States six or eight months ago. If this is so, we must look for Canadian business to improve rapidly during 1923. The farming situation is better and more favorable conditions prevail in trapping and trading centers of the north woods owing to the state of the fur market and the plentitude of furred animals. British Columbia is in a more prosperous position than the prairies. Its farmers did fairly well last year and the fruit-growing sections had very profitable yields. Lumber demand is expected to develop to quite sizeable proportions. Even in the mining towns I look for a fair improvement. In British Columbia business during the spring months should be good.

"Canadian sales efforts during the next few months should be concentrated on the eastern provinces. The industrial communities of Ontario and Quebec look relatively the best and even in the agricultural sections conditions are more favorable than on the prairies. Mixed farming helped to lighten the load of the eastern farmer. Industrial activity in Canada is estimated to be in the vicinity of 70 per cent of capacity. Unemployment and short time is still prevalent in some lines. Gold mining is an outstanding exception. This line is fairly busy and is resulting in considerable prosperity in such centers as Porcupine and Kirkland Lake, Ontario.

"Industries manufacturing goods for human consumption or covering are perhaps most active and have the most encouraging outlook. The best customers will be found in the cities. I have in mind all of the manufacturing centers of southern Ontario and Quebec, but especially these producing pulp, boots and shoes, textiles, clothing and food products. In the maritime provinces, a firm foundation is being built up for business improvement. Basic industries are now dull, but I believe that warmer weather will bring decidedly better markets for lumber, fish and other local products. By summer, New Brunswick and Nova Scotia should look nearly as attractive to sales representatives as southern Ontario and Quebec.

U.S. Must Turn to Canada

"A more hopeful feeling is developing, however, in the prairie and other agricultural regions. Better prices for farm products are helping the Canadians as well as the farmers in the States. As the Canadian farmer was slower in feeling the good effect of this increase in prices of farm products, so, he will enjoy it longer. It seems to be a fundamental principle of economics that the Dominion lags about a year behind the States, both as to action and reaction—decline and recovery. Hence, I say that while today conditions are better in the States, they may be better in Canada next year. Business conditions are much like a storm—they travel across the country in waves. Each section gets the storm, but all do not get it at the same time.

"The United States should be better neighbors to Canada. Some day the States must turn to her for natural resources. When our timber is gone, when our water power is all developed, when the price of land here makes the raising of cattle prohibitive, we must turn to Canada.

"The Babson chart continues to register the slight inflation to which I have already referred. Today it still stands at 5 per cent above normal. With the readjustment only 60 per cent completed, this is not a healthy sign. It is dangerous to raise prices or wages at the present time. Let us have prosperity, but let us not have inflation. Things that have recently occurred in the stock market, the spirit of the bootleggers, and the general desire of almost everyone to get something for nothing are not healthy signs here in the States. We need more character and less speculation at the moment. It, of course, is true that men make values, but let us not forget that souls make men."

Ontario Provincial Highway Contracts

Awards Not Previously Reported

897—Asphaltic concrete pavement, Pickering to Whitby, 5.1 miles—D. O. Johnson, 43 Market St., Brantford, Ont.

918—Asphaltic concrete pavement, Kingston Rd., from G. T. R. crossing to east limits of York county, 4.4 miles—Provincial Paving Co., 24 Adelaide St. W., Toronto.

808—Grading Mardon north, 4.0 miles—T. B. Farrell, Arthur, Ont.

810—Grading, Acton to Georgetown, 4.0 miles—Randolph Macdonald Co., Crown Office Bldg., Toronto.

820—Concrete culverts, Drummond township Smith's Falls Construction Co., Smith's Falls, Ont.

826—Concrete culverts, Sidney—W. G. Gibson, Box 277, Port Hope, Ont.

827—Concrete pavement, westerly from pavement west of Chatham, 3.7 miles—McNamara Bros. & Thornton, 23 Scott St., Toronto.

828—Concrete Pavement, Clappison's Corners to Bridge No. 3, 2.0 miles—Trans-Canada Paving Co., Hamilton, Ont.

855—Concrete culverts, Eramosa—F. C. Shipp, Box 131, General Post Office, Toronto.

832—Macadam roadway in west limits of Morrisburg, 0.3 miles—McLean & Stidwell, Cornwall, Ont.

833—Macadam roadway, Rideau, N. E. 4.0 miles—McGinnis & O'Connor, Kingston, Ont.

865—Macadam base course, Farran's Point, westerly 3.7 miles—McLean & Stidwell, Cornwall, Ont.

941—Macadam base course, Cayuga to Nelles Corners, 4.8 miles—John Person, Stevensville, Ont.

875—Grading, Caledonia to Hagersville, 4.0 miles—Webster Contracting Co., Bank of Toronto Bldg., London, Ont.

894—Concrete pavement, Crumlin, easterly, 2.75 miles—Boss & Brazier Construction Co., London, Ont.

895—Concrete pavement, Essex to Maidstone, 4.00 miles—Campbell & Lattimore, C.P.R. Building, Toronto.

938—Concrete pavement, St. Thomas easterly, 2.0 miles—E. G. Martin, Elmira, Ont.

898—Asphaltic concrete pavement, Hamilton southerly, 4.0 miles—Hamilton Contracting Co., 72 James St., Hamilton.

899—Macadam roadway, Odessa easterly, 3.1 miles—McGinnis & O'Connor, Kingston, Ont.

900—Macadam base course, west limits Yonge township easterly, 3.9 miles—Chisolm Wellanger Co., Lancaster, Ont.

901—Macadam base course, Beckett's Bridge to Chambers Corners, 2.3 miles—Law Contracting Co., 107 Hillsdale St. E., Toronto, Ont.

920—Macadam base course, from 3 miles west of Cornwall westerly, 3.8 miles—W. T. Woodland, Cardinal, Ont.

902—Grading, Hawkesbury west, 1.8 miles—V. Belanger, Hawkesbury, Ont.

903—Grading, Richardson sideroad to town line, 4.1 miles—Laplante & Lerouse, Box 941, Cornwall, Ont.

905—Grading, from 3.3 miles south of Elgin southerly 4.0 miles—M. G. Henninges & Co., Smith's Falls, Ont.

906—Grading, Kenilworth north, 4.0 miles—C. Cook & Co., Orillia, Ont.

910—Grading, Arkona south to Sarnia gravel road 4.8 miles—Hugh Tweddle, Ailsa Craig, Ont.

911—Grading, Clinton to Seaforth, 4.0 miles—Webster Construction Co., Bank of Toronto Bldg., London, Ont.

912—Grading, from 2 miles west of Clifford westerly, 2.5 miles—James Milligan, Iroquois, Ont.

913—Grading, Tillsonburg easterly, 4.9 miles—Steward Construction Co., Paris Ont.

943—Grading, Stittsville to Stanley's Corners, 2.0 miles—McNamara Bros. & Thornton, 23 Scott St., Toronto.

944—Grading, Elgin Station N.E., 4.0 miles—M. G. Henninges & Co., Smith's Falls, Ont.

945—Grading, Durham south, 7.0 miles —Britnell Contracting Co., Baxter St., Toronto.

946—Grading, Orford, 4.0 miles—W. C. Crummer & Strain, Cedar Springs, Ont.

947—Grading, Ekfrid, 5.0 miles—W. C. Crummer & Strain, Cedar Springs, Ont.

949—Grading, from 3 miles west of Parkhill westerly 1.4 miles—Dep't. Public Highways of Ont.

950—Grading, Clinton west, 3.2 miles—Webster Construction Co., Bank of Toronto Bldg., London, Ont.

952—Grading, west limits of Welland County easterly on Forks Road, 3.0 miles—W. T. McAuliffe, 85 Colbeck St., Toronto, Ont.

953—Grading, 9th to 11th Con., 1.8 miles—Department of Public Highways, Ontario.

844—Grading, Sarnia gravel road from Arkona sideroad west, 4.0 miles—Department of Public Highways, Ontario.

954—Bridge Abutments, extension to two steel bridges on Stratford-Goderich road—John Gaffney, West Monkton, Ont.

955—Bridge abutments two Walkerton bridges and Mildmay bridge—John Schwickler, Mildmay, Ont.

957—Bridge abutments, McKenzie Creek on Caledonia road—Canadian Des Moines Steel Co., Inshes Ave., Chatham, Ont.

958—Bridge abutments, Boston Creek on Caledonia road—R. H. Blackwell, 57 Queen St. W., Toronto, Ont.

959—Bridge abutments, Bloomfield Bridge—W. P. R. Holdcroft, Kingston, Ont.

962—Bridge abutments, Elginfield Bridge—Elmer Lawson, Crediton, Ont.

937—Concrete culverts, King and Whitchurch townships—N. Dillane, 291 Yonge St., Toronto, Ont.

Essential Points in Sewer Design

Cross Sections that Are Generally Used and the Advantages and Disadvantages Pertaining to Them—Influence of Soil and Other Conditions on Construction

(Continued from last issue)

Sewer inverts are usually built of concrete in concrete sewers. In the past, where excessive velocities have been expected, lining with tile or brick has been adopted. Except in extreme cases, this is not resorted to in present practice, so much as in the past. Where steep grades and grit are encountered this protective phase should be investigated. Lining means additional cost, because the use of a material of this type as a lining may slow up construction. Rich dense concrete floated to a hard finish should be good for velocities up to 15 or even 20 ft. per second. In a sewer such velocities are usually only occasional.

The resistance of concrete or other materials to scouring action is a subject on which little data is available. Tests made by E. S. Rankin and described in the proceedings of the American Society of Municipal Improvements indicate that good concrete wears surprisingly well, and that under continued wear of heavy abrasion in his tests six in. of good concrete should be equivalent under the same conditions to a high grade paving brick four in. in thickness.

In placing concrete on inverts, the method of construction must be carefully worked out to secure the best hydraulic results, i.e., a smooth invert on uniform grade. A liberal use of pieces of reinforcing steel driven in to correct grade is helpful. In some shapes of sewers the use of precast concrete blocks to carry the forms has proved worth while. In other shapes, the placing of a segment of the bottom in a section has been successfully screeded to a hard finish. In large sections with comparatively flat bottoms the bottom should be placed first and preferably screeded to finish. Plastering afterwards on a rough bottom is difficult.

Placing Concrete

The consistency should be plastic enough to flow readily in the forms and around reinforcing steel. According to modern investigations, too wet a mix is as bad as too dry. The sidewalls and lower portion of the arch can be put in with a wetter mix than the crown. By judicious use of outside forms and choice of consistency a dense arch can be secured. Where trenches are wet, the mix for the bottom is often made rather dry to absorb moisture in the trench. Where the invert is reinforced a lead mix may be placed as a skin coat in moist trenches.

Mixing

The mixing is usually done by a portable plant on sewer work of the smaller sizes. On large work where 20 to 40 ft. make a good daily run, a central mixing plant may be worth while of a semi-portable type. This plant can be arranged to move, from time to time, to save long travel of the mixed concrete in the cars.

On large work the materials can well be brought up on standard gage cars where space permits. On small jobs, team delivery or narrow gage haul from rail connections are usual.

Cement nowadays is frequently tested before leaving the mill, so that sufficient time elapses for the 7 day test to mature before the cement goes into the work. Hence the contractor generally carries only enough cement on hand to tide over any delay on transportation.

Forms

On standard sections, steel forms have grown in use during the last ten years, on sewer work. The type of form must be selected for the work. A different type being used frequently in tunnel work from that in open cut. Ease of handling and sufficient stiffness and weight to stand use are requisites of successful forms. Steel forms must be kept clean and oiled.

On special work or short jobs, wooden forms are often resorted to, because of the ready applicability to meet all conditions and the speed of construction.

Where reinforcing steel is to be placed, special attention should be given to the form design to provide means of holding the steel accurately in place.

Removal of Forms

The hardening of the concrete before removal of forms varies considerably with the weather and size of the sewer. In warm weather removal is possible in 24 to 36 hours on the smaller sizes and 48 hours and up on the larger. In cold weather longer periods are desirable. Backfilling usually can commence in from 3 to 7 days. Care should be taken to avoid eccentric loading and shock from dumping.

Cold Weather

Cold weather precautions may be varied. The water or aggregates may be heated. The work when in place may be heated by salamanders or by steam pipes. Tarpaulins may be used to cover the trench. Every necessary precaution must be used to prevent the freezing of the concrete before hardening. The best practice seems to be to avoid the use of any soluble chemicals which will reduce the freezing point of the water. Many specifications for sewers limit the winter work. Others forbid all work in open cut between certain dates, covering the winter months. This is a matter of regional practice.

Aggregate

The choice of aggregate rests somewhat on local markets. In general well graded materials are sought. In many localities natural sands or gravels are better graded than artificially crushed stone. Good work can usually be done, however, with suitable combinations. As a rule the use of rock screenings instead of sand is barred.

The proportions of sewer concrete mix vary somewhat between limits of 1 cement to 5 of fine and coarse aggregates and 1 of cement to 9 of fine and coarse aggregates. A very common mix, particularly for reinforced work is 1 to 6, i.e., 1: 2: 4. In many localities with commercial aggregates, 1 to 9, i. e., 1: 3: 6 appears too lean for good work. Many designers feel that the difference between the cost of a 1: 2: 4 and a 1: 2½: 4½ mix or a 1: 3: 5 is so little compared to the other costs, that the richer mix is preferable throughout.

Construction Developments During the Month of April

Figures Compiled by MacLean Building Reports, Ltd., Show Trend of Building Activities for Last Month—Details of Contracts Awarded in Eastern and Western Canada

Construction Contracts Awarded in Eastern Canada, April, 1923

	Ontario		Quebec		New Brunswick		Nova Scotia		Eastern Total	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	9	$ 417,000	6	$1,380,000	1	$25,000	.	.	16	$1,822,000
Churches	11	611,000	7	171,500	.	....	. .	. .	18	782,500
Factories	18	863,000	7	150,600	3	46,000	. .	.	28	1,059,600
Garages, Public	13	139,200	1	50,000		... . ..		.	17	189,200
Hospitals	3	182,000	. .	....	. .	....	1	70,000	4	252,000
Hotels and Clubs	8	452,000	6	150,000	1	5,000	1	8,000	16	615,000
Office Buildings	7	353,000	1	4,300	1	12,000		....	9	369,300
Public Buildings	6	251,800	2	28,500		....	....	....	8	280,300
Residences	1428	6,580,100	487	2,438,400	5	20,200	6	26,500	1926	9,065,200
Schools	17	564,500	6	363,800	1	1,500	. .	....	24	929,800
Stores	40	577,600	20	215,000	4	22,000	2	25,500	66	840,100
Warehouses	8	1,704,500	4	2,713,000	.	....	. .	....	12	4,417,500
Total Buildings	1568	$12,695,700	550	$7,665,100	16	$131,700	10	$130,000	2144	$20,622,500
Bridges	4	367,400	15	426,000	3	20,300	. .		22	813,700
Dams and Wharves	3	541,400	....	....	. .	....	. .	.	3	541,400
Sewers & Watermains	13	148,800	2	45,000	. .	....	. .		15	193,800
Roads and Streets	23	1,566,000	28	953,200	.	....	. .	. .	51	2,519,200
General Engineering	15	2,080,000	10	816,000	1	20,000	10	750,000	36	3,666,000
Grand Total	1626	$17,399,300	605	$9,905,300	20	$172,000	20	$880,000	2271	$28,356,600

Construction Contracts Awarded in Western Canada, April, 1923

	British Columbia		Alberta		Saskatchewan		Manitoba		Western Total	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	....	$..........	....	$..........	1	$ 12,000	. .	$. . .	1	$ 12,000
Churches	1	2,500	.	....	. .	....	.	. . .	1	2,500
Factories	3	105,000	3	10,000	1	2,000		. .... .	7	117,000
Garages, Public	1	5,000	. .	....	1	5,000	2	13,000	4	23,000
Hospitals	1	2,600	. .	....	1	60,000		....	2	62,600
Hotels and Clubs	1	41,000	1	2,000	.	. ...	.		2	43,000
Office Buildings	4	28,000		. .. .	1	9,000	.	...	5	37,000
Residences	128	533,200	15	36,800	18	71,600	68	231,300	229	872,900
Schools	4	50,100	1	7,100	5	18,500		. . ..	13	75,700
Stores	11	63,400			7	160,000	6	92,000	24	315,100
Warehouses	2	8,000	2	77,000			1	5,000	5	90,000
Total Buildings	156	$838,800	25	$132,900	35	$338,100	77	$311,300	293	$1,651,100
Bridges	....	....	1	15,000	5	24,000	4	16,200	10	55,200
Sewers & Watermains	....	....	....	....	....	....	2	144,400	2	144,400
Roads and Streets	3	510,000	....	....	1	75,000	....	....	4	585,000
General Engineering	....	....	1	18,500	2	33,000	....	....	3	51,500
Grand Total	159	$1,348,800	27	$166,400	43	$470,100	83	$501,900	312	$2,487,200

What Are Common Sewage Disposal Methods?

Definitions and Explanations of Treatment Schemes That are in General Use—The Characteristic Features and Special Merits of Each

The methods of sewage disposal and treatment in common use are defined in the report of an engineer who made investigations into the sewage situation of a certain town. As the explanations of the systems are clear though brief they are given herewith for the benefit of readers who may be interested in sewage disposal.

Skimming Tank

A skimming tank is simply an enlargement of the sewer, especially a portion of it that can be run under pressure adjacent to the tank so that sticks, matches and grease may rise to the surface of the water and can be skimmed off from this surface; this treatment prevents the unsightly mass usually found in the vicinity of submerged outlets.

The facility with which this floating material rises to the surface of such a tank is exemplified in every manhole throughout the Joint Sewer where the sewer is running under a slight pressure. Here we see matches, fecal matter, orange peels, etc., floating on the surface. This might be considered the simplest form of sewage treatment. Of course, it stands to reason that a very small portion of the floating matter in the sewage can be taken care of in this manner.

Screening

Fine screens are coming into more general use year by year; in some places as the only treatment given the sewage, but in the majority of cases, as one of a series of steps in sewage disposal. While the Reinsch-Wurl screen is undoubtedly the most durable screen so far put upon the market, a number of other satisfactory screens of lighter construction and consequently of less cost are giving good service. Whether they will continue to give good service without the heavier construction of the Reinsch-Wurl screen remains to be seen.

Where screening plants are adopted, it is necessary of course, to provide some means of disposal for the screenings. This disposition has been made in a number of ways: (a) by incineration in a small garbage incinerator erected for the purpose; (b) by treating them as ordinary refuse to be dumped either upon land and burying or, following New York City's practice, of putting them on barges with the rest of the garbage and dumping them into the sea.

Imhoff Tank

The Imhoff tank or what is known as the two-storey tank is a receptacle in which the sewage is permitted to flow across an upper chamber (the settling compartment) connected hydraulically with a lower chamber but separated therefrom in such a way that gases formed in the lower chamber are prevented by baffles from entering the upper chamber. The settling compartment has a capacity of one and one-half to two hours flow of sewage.

The sewage passes through the upper compartment with a velocity of one and one-half to two feet per minute and drops from forty (40%) to sixty (60%) per cent of its solid matter onto the sloping bottoms of the upper compartment; as it accumulates in the sloping bottom, its weight causes it to slip through slots into the lower compartment, known as sludge compartment. The accumulated sludge in lower compartment gives off gases and becomes in turn thoroughly oxidized so that material in bottom of the lower compartment when drawn off has no odor. It has the characteristics of ordinary humus or garden dirt.

It is customary to provide the lower compartment with vents direct to the open air. These vents should occupy approximately about twenty (20%) per cent of the total area of the tank. In many places where insufficient vent capacity has been provided trouble has occurred with boiling and foaming, although it must be admitted that in many places even where adequate vents have been provided, foaming and boiling over has also occurred.

As stated above the lower compartment is larger than the upper compartment, in fact the lower compartment in a northern climate should have a capacity for sludge storage of as much as one and one-half to two cubic feet per capita. In southern climates this can be substantially reduced, the reason being that in the South the contents of the lower compartment can be discharged more frequently, whereas in the northern country three, four and five months in winter might elapse before the sludge can be discharged upon sludge beds which will drain off properly and dry out sufficiently well so that the residue may be handled.

Imhoff tanks as a rule are constructed without covers. There are many exceptions to this rule, however; several tanks constructed by the writer have been covered, and throughout the South a number of tanks have been constructed with covers. The function of a cover in an Imhoff tank is to control the odors.

It stands to reason that where there is a retardation in the flow of sewage, sludge must be precipitated to the bottom of the tanks, and some method must be adopted for its removal. The amount of this sludge is small and it is not disagreeable and there should be no difficulty in getting rid of it. Unless it is tanked immediately and pumped to sea, the construction of sludge beds are needed and on a plant the size of the one contemplated in this report. These sludge beds take up considerable room. Formerly a provision of 33/100 of a square foot per capita was considered good practice in the design of the sludge beds. The practice today is to double this area and where combined sewers are used to triple the area.

Alvord Tank

Imhoff tanks with two compartments, one above the other are necessarily deep tanks, and since the principle of separating the solids from the fresh sewage is recognized as a good one, modifications of the Imhoff tank have been suggested to reduce its depth, and thus to minimize expense of excavation. This is exemplified better in the Alvord tank than in any other tank. The principle of the Alvord Tank is to remove the solids from the sewage collecting in a settling tank of moderate depth and to convey them to a secondary tank parallel to the settling tank, the digestion taking place in the second tank in a similar manner to that in the lower compartment of the Imhoff tank. In the Imhoff tank proper, the sewage is lead into the second compartment by gravity whereas in the Alvord tank the sewage must be mechanically manipulated to a greater or lesser extent.

Biolithic Tank

The old fashioned plain settling tank sometimes called the "biolithic tank" is still in use and is giving good results. From two to six of these tanks are placed in parallel and the fresh sewage is allowed to flow in to one tank for a given period, at the end of which period the tank is cut out of commission as a settling tank and is allowed to function as a sludge tank until the sludge becomes decomposed and changes its characteristics in a manner similar to the decomposition of the sludge in the Imhoff tank; but not to the same extent.

Activated Sludge Process

One of the new methods of sewage disposal is known as the activated sludge process which gives an entirely satisfactory effluent from almost any viewpoint. But in the process of procuring this effluent there is accumulated very much more and wetter sludge than from any other process and so far, there has been no satisfactory solution for the economic treatment of this sludge.

Electrolytic Process

There has also come into use in recent years in a more or less practical form the "direct oxidation process" or what is more popularly known as the electrolytic process. The fundamental theory upon which this is based is not new. As exemplified in the so-called Landreth process, a considerable step forward has been made in its practical development. In this process the sewage is passed through water-tight wooden boxes in which there are placed a great many electrodes spaced at short intervals and between these electrodes are placed revolving paddles which remove the gases which accumulate on the electrodes. If not removed, these gases would cause polarization of the apparatus.

It is considered necessary to use lime in connection with the direct oxidation process to increase the conductivity of the liquid and to reduce the quantity of electricity used. There are certain critics of this plant who say that exactly the same results can be obtained without the use of the electric current. This I do not believe to be true, although it is true that lime has been used for many years with great success in connection with chemical disposal. The great objection to the use of lime has been not so much the inability to produce good results but because vast accumulations of sludge results and also because of secondary putrefacting actions which take place in the body of the water into which the treated sewage was discharged.

Is Integral Waterproofing Desirable?

A Practical Discussion of the Problem Based on the Investigations of the Author—Integral Waterproofing is Found to Have Important Advantages

By SAMUEL R. T. VERY, Architect

A pertinent and impertinent deal has been written, said, and thought upon the subject of this article, which has to do with the use of integral waterproofing compounds in portland-cement plasters, mortars, and concrete masonry as used in architecture. The exposition by zealous waterproofing compound manufacturers of the merits of their products and the dissension by earnest portland-cement manufacturers have been so convincing that no bewildered architect who has followed the controversy can fail to appreciate the humbuggery of some of the opposing views, whichever side they state.

Scientific writers on the subject have not shed much light upon the facts; as a rule they are hopelessly cautious, or their observations are so elaborate, or meticulous, or involved with other research as to discount their authority; and sometimes they, too, are fiercely partisan. But all of the wrangling gentlemen are in truth engaged in a controversy which has little to do with the point; and it is the intention of this brief to illuminate this point and settle the controversy.

Waterproofing compounds are exactly what both sides claim they are: unnecessary when ideal and perfect mixtures, conditions, and labor are employed, but necessary at all other times (which is nearly always). It is a fact that the personal equation of workmen is the principal field condition which prevents ordinary portland-cement concrete, properly mixed, and ordinary stuccos from being as waterproof without a good compound as with it.

Laboratory Tests Not Infallible

Identical claims of both sides have been proved and disproved by laboratory tests, which, however, are usually open to serious faults. Like Darwin's remarkable study of pigeons, observation of more specimens than can be available to any one laboratory worker would be necessary to draw an infallible conclusion.

The over-refinement of laboratory specimens of untreated concrete sometimes has shown them up the equal of the "waterproofed" specimens; it is astonishing that the keen observers employed by certain representative cement companies and by the United States Bureau of Standards do not appreciate the importance of that fact.

There is also an utter difference between laboratory-test conditions and field, or job, conditions. Tests upon specimens mixed in the laboratory do not determine the practical efficiency of waterproofing compounds to be used in the field, where the personal equation of workmen is so variable. This last is the cause of the practical impossibility of untreated portland-cement concrete being uniformly, homogeneously waterproof. It is a matter of such unigeneral knowledge that it seems silly to take space to say it, but in view of the misleading findings from trained, conscientious, and truthful laboratory workers, it should be noted here that when concrete foundations leak, it is rarely a homogeneous leak—a veritable sponge that appears; some spots are dry; some portions are better than the rest.

A whole lot of well-made laboratory specimens may be good, bad or indifferent without proving a criterion for the field. The laboratory worker with his profound erudition in explaining the humbuggery of his opponent's views (whatever they are), with his integrity of effort to purge the gullible world of fraud, goes conscientiously to work mixing his little pats just so, eliminating the tiniest exotic. He sets his hairweight scales and blows from the heavier pan with an air washed blast the speck of dust just landed, and smiles exultant in having thus saved to the world a true and "typical" specimen.

This specimen, remember, is about to be compared to the average work of those great thumb fingered, gawky, red-necked foreigners at the mixing-box, measuring their masses with dented buckets, and barrels sometimes stove in and patched; measuring what? The nice, pure, uniform, round white globules of Ottawa laboratory-testing sand, and some brand-new portland-cement, selected for its test-safety? Oh, no! They measure what the boss has got to buy for the least outlay the specifications will allow (and sometimes less than that). And they are not very fussy, either, to fleck away the speck of dust. They slap the stones and sand and cement together in a mixer, pour in the water, and it comes out mud, and they treat it so. And then those unsentimental fellows with tremendous shoes tramp down the mass in the trenches (if the rednecked boss is looking), and call for their pay on the stroke of twelve next Saturday.

The Architect's Dilemma

The combination of distracting circumstances, at first, when waterproofing compounds made their appearance, quite confused the average architect, who thought he had been born with a little common sense, but who hesitated to admit it in the face of contradictory evidence from such authoritative sources. Certainly, he could not decide alone the virtues of the opposing claims.

In consequence, the writer being one of them, after reading as much of the subject as his professional leisure permitted (which was a good deal), and after discussions of the waterproofing qualities of particular compounds with fellow practitioners, none of whom seemed to know certainly about the truth, and most of whom knew nothing whatever, decided to figuratively roll up his own forensic sleeves, and debate the issue with every manufacturer of cements and cement waterproofing compounds in the world; and he ended by actually rolling up his linen sleeves, and mixing and testing a large number of specimens of portland and natural cements, some treated and others untreated with various alleged waterproofing compounds.

These tests were then, and still are, so far as the writer is aware, unique in these respects. They were not made with any greater care than would obtain in the field "on the job." They were not conducted for scientific results, but to obtain, as nearly as possible, job conditions and comparisons. No manufacturer was present at the mixing.

No concrete was tested, because stuccos were far simpler to manipulate, and they were quite as satisfactory for the purposes intended: to find out whether cement mixtures are made more nearly waterproof through the use of integral waterproofing compounds.

The results of these tests prove the writer's acumen prior to their undertaking, which, owing to the controversy between factions whose interests were apparently not antagonistic he was beginning to seriously doubt. He discovered the phenomenon that a waterproofing compound is a waterproofing compound. In addition, the results disclosed some very interesting facts concerning the deleterious effects some compounds have upon stucco mixtures, which while probably waterproofed with them in the sense that their introduction under practical working conditions would make the batter less permeable, are weakened by them, and in some cases shrunk.

No Stage Setting

The apparatus for mixing the specimens was purposely chosen for its unlaboratory character, for its similarity in crudeness to job or field conditions. No hair-scales were used, nor superdented buckets for that matter; average job conditions were approximated. Scales akin to those likely to be found under practical working conditions were chosen, where the variation of a hundredth part of a gramme wouldn't scare the operator a hundredth of a particle. An ordinary tumbler measured out the sand and cement and some of the compounds tested.

These tests were to prove or disprove the efficacy of the use of waterproofing compounds under practical working conditions, and no care whatever was taken to see that Mr. Manufacturer A's compound would theoretically exclude one drop more moisture from a hundred square feet of stucco than Mr. Manufacturer B's, although that seems to be the gist of the squabble between some compound and cement manufacturers.

Care was taken, however, to mix the great batters well, as well as they could be reasonably expected to be mixed on the job—as well as a good workman with intelligence and experience, or as well as a bad workman under the guidance of a good boss. Moreover, the directions of all the manufacturers of the waterproofing compounds used were read with only such intelligence as the writer happened to possess, but were followed as rigidly as he could expect of a cement mason who had never used the material before.

Much larger masses of dry sand and cement were mixed in a heap, and some specimens untreated and others treated with the different compounds tested were made from the same dry batter. Minute records of every operation were kept, even to the number of trowel strokes in mixing the dry mass; the quantities of water and other ingredients used were recorded; but note, all this was incidental, as explained above. Now that the tests are concluded, and a number of years have elapsed during which more is known of such compounds, the records are of interest to show how silly a thing a laboratory test might be made in proving practical comparisons. For example, the specimen whose record shows most perfect laboratory proportions of ingredients proved to be less waterproof than another of identical ingredients less scientifically prepared.

Two kinds of sand were used: white Ottawa laboratory-testing sand and ordinary commercial Cow Bay sand. Right here is the place to emphasize the fact that on the job it is not common to use white Ottawa laboratory-testing sand, whose use is usual, however, for the refined tests which have proved such amazing waterproofing laboratory perfection for some unwaterproofed portland-cement concrete specimens. But if it were usual to use such sand, no workman would have taken more care in the mixing and, incidentally, no laboratory chemist less.

The cements tested were both gray and white typical commercial brands of portland cements widely used, equal to the standard specifications of the American Society for Testing Materials, and also natural American hydraulic cement, generally called Rosendale.

Waterproofings Used

The integral waterproofing ingredients tested, in the opinion of the writer, were typical of the various widely used, so-called repellent, non-repellent, metallic powders, pastes, emulsions, soaps, and liquids, which one writer at that time called Unsaturated, Extended and Concentrated Colloids. No mere surface coatings such as membranes or damp-proofing paints were tested. The specimens were formed and set in rings cut in 1-inch sections from a wrought-iron gas-pipe 4 inches in internal diameter, and were uniform in superficial shape and form, being thus approximately of the same mass when set, and the thickness of many stuccos.

The tempering water was ordinary "Croton" water as drawn from the faucet of the New York testing laboratory, just such water as a mason would use on any ordinary New York building operation, shockingly unfiltered! And no doubt chock-full of unscientific conditions which would horrify the gentlemen who commonly perform tests similar to these.

No particular overcare was used to measure with scientific accuracy ideal quantities for ideal results, but the manufacturer's requirements were nevertheless followed as rigidly as by the ordinary practical workman. Quantities used in each case were recorded merely as a matter of interest, not for scientific deduction, but the measure, gauges, scales, and other instruments used were scrupulously cleaned after each operation, and drawings, photographs, and careful descriptions of each were kept. As the object of this paper is not scientific, however, other such details will be omitted.

The samples of cement and waterproofing compounds were delivered in well-protected packages, were typical of job deliveries, were in perfect condition, and new. The quantities used were insignificant compared with their bulk as received. Before any mixture was made, the writer interviewed carefully the representatives of all of the manufacturers whose courtesy encouraged the tests, and here should be stated that almost universal and enthusiastic response was received from his request for co-operation. Their specific instructions were reviewed in their presence, as by a mason foreman as rigidly as any job conditions would approximate.

Persons Present at Tests

No other person than the writer was present during the mixing, thus assuring the same "personal equation" for all the specimens. Each ring was numbered with a removal tag, which, months later, just before testing, was each removed in presence of all of the witnesses of the tests; and at that time, new, entirely different designating letters were marked directly upon the specimens themselves, the changes being accurately recorded and witnessed by all, without anybody present, not even the writer himself, having the slightest idea of the identity of a single specimen. Therefore, unlike the usual laboratory test, no results were being anticipated.

Great batches of dry cement and sand, many times the needed quantities, were thoroughly mixed uniformly in the quantities of 1 to 3, and the amounts necessary for specimens identical in their matrix were chosen from the same homogeneous batch (except in certain instances to be mentioned). The large superfluous balance was immediately discarded.

Seven specimens using white portland cement and white sand from the same batch were tempered and set May 3, 1914. Seven specimens using gray portland cement and white sand from the same mixed batch were tempered and set July 27. The specimens remaining, using, respectively, Rosendale cement, gray portland cement, and white portland cement, were mixed with different sands, and were tempered and set July 27 and July 28.

Thick, soaked blotting-papers, themselves protected so as to evaporate slowly, were used to cover the rings without touching them, and they were allowed to dry very slowly by ordinary evaporation. The specimens were otherwise unmolested until the middle of August, the same year, when they were carefully wrapped in paper, and kept so until March, the following year, when they were unwrapped, and all placed together in a large bucket filled with water in which they remained submerged one day.

Hydraulic Testing Machine

The next day, in the presence of representatives of all of the manufacturers concerned, who accepted the invitation, these specimens were remarked, as above stated, in such a manner that their cement and their waterproofing ingredients were both blind to all present, and they were tested carefully in a special hydraulic testing-machine. Its construction is such that water may be forced through the whole area of a specimen without leakage about the ring circumference. Its pressure gauge is calibrated to 150 pounds per square inch of surface tested, but the pressure chosen for these tests was only two-thirds that capacity.

There was not a single specimen tested which did not show porosity to some extent; but it should be noted that the pressure used was far greater than most field or job requirements. Some specimens showed porosity markedly more than others; some showed structural weakness, developed, no doubt, from the tremendous pressure used, which approximated a head of water 200 feet in height.

Two specimens blew up, probably from inherent weakness not due in any way to the waterproofing compounds.

There was not a single "unwaterproofed" specimen of the six tested that proved the equal of the best of the waterproofed specimens; but one of the six which contained gray portland cement and ordinary Cow Bay sand only, tied for third place out of the whole lot with waterproofed specimen mixed in identical proportions, 1 to 3, with white portland cement and white sand. The best of all showed absorption of only 1¼ cubic centimetres. This was waterproofed with a compound mixed with white portland cement and white Ottawa laboratory-testing sand.

The second best, specimen, was mixed with another compound. The poorest of all, with the ex-

[illegible] of the two which burst, and some others, referred to later was, strangely enough, of identically the same consistency as the best untreated specimen previously mentioned. It absorbed 21½ cubic centimetres of water.

[illegible] all superficial appearances this less-waterproofed specimen is even more perfect than its mate which absorbed but 4½ cubic centimetres of water; it was mixed the same day, with the same ingredients taken from the same packages, but not mixed dry in the same batch. It was tempered with slightly more water, but was tamped the same number of times. This observation illustrates well the writer's opinion that unwaterproofed portland-cement mortar is largely dependent for its waterproof properties upon the variable personal equation of the men mixing or placing the batch.

While permeability was the sole experimental quest in these tests, the specimens show other interesting characteristics. Four of the waterproofed specimens showed, when wet, cracks invisible when dry. Their waterproofing compounds were, respectively, a paste, a liquid, and two powders, which divide the glory impartially amongst all classes tested. The two specimens which burst probably succumbed to too great pressure for their structural efficiency rather than to any deleterious effect from their waterproofing ingredient, which was in both cases the same as the compound which proved to be the most effective one recorded.

What Integral Waterproofings Do Not Do

Waterproofing compounds are not intended to increase the structural pressure resistance of cement mixtures. They are not even intended to increase the theoretical waterproofing efficiency of unwaterproofed stuccos over the practical least efficiency of treated stuccos; or to state it in a different way, they are not commercially intended to raise the laboratory-waterproofing efficiency of cement or concrete briquets.

They are not theoretically intended to increase the density of the stone aggregate in concrete nor to lessen its natural absorption, except on or near its surface. They are not intended to bodily automatically replace the honeycomb voids of ill-mixed, ill-placed, badly proportioned concrete. They are not intended to act as a panacea for all waterproofing ills.

They cannot convert ignorance into knowledge, and they will not change inefficiency into skill. Neither will they ruin the commercial profit of portland-cement manufacturers, who, if they only knew it, would have much better friends amongst some architects and some clients if their product could be used with the greater safety which their co-operation with, instead of antagonism to, manufacturers of good integral waterproofing compounds would warrant; there is nothing chemically deleterious to portland cement from many of these compounds, nor are they in any sense competitors of portland cement.

What Integral Waterproofings Do

They do, however, partly lessen the importance of the personal equation of cement-workers, who must, when using them, pay more attention to proper grading, mixing, tempering, and placing of concrete and stucco batches. They undoubtedly do bodily replace some of the imperceptible pores in even the best field specimens (there is a loss of approximately 7 per cent by weight of water evaporation from a theoretically perfect density of mix). They increase the colloidal efficiency of cement.

They act somewhat as catalyzers, and cause a decrease in the normal number and natural size of the honeycomb voids; they help the mixture to densify itself. Some of them decrease and some abolish the capillarity of concrete and cement stuccos.

And unless the writer is mistaken, they will be eventually the cause of a tremendous increase in the architectural specification of cement stucco, now often justly feared, and even dreaded, by clients who prefer other materials known to be free from the common, obvious, and prevalent faults of unwaterproofed cement work. The United States Department of Agriculture got on record as long ago as 1915 saying "no amount of care in the preparation of concrete prevents the absorption of water into the mass. The addition of some water-repelling compound appears absolutely necessary to insure this result."

This article is purposed to rouse persons interested in the discussion of integral cement waterproofing compounds to a realization of a few of the fallacies sponsored by champions of all of the current opposing claims. It has accomplished a mighty service if it has cleared away the cataract from a single biased eye; but if by lucky chance the cataract was upon the scientific eye of one of those mischievous, theoretical, laboratory cement-testing experimenters who have promulgated and spread the false notion that cement waterproofing compounds are useless just because it is theoretically possible to make cement mixtures impermeable without them; or if by luckier chance it was blinding the avaricious eye of a manufacturer more interested in the sale of his waterproofing product than in the advancement of its merits by scrupulous adherence to fact, its service has been colossal.

There is no doubt that the latter class has done more harm to the engineering advancement of integral waterproofing than the former, who at least have nothing to gain by their antagonism; indeed, they have much to lose. Conservative architects would rather take a chance with old-fashioned methods which sometimes prove efficient than with "panaceas" for their occasional faults, commercially exploited by exaggerated claims which can easily be disproved.

But there is no doubt in the mind of the writer that some of the practical disadvantages from lack of integral waterproofing such as stucco-staining, discoloration, disintegration from frost and weather, and development of hair-cracks, and also many ills from dampness due to sub-surface drainage, and seepage through unwaterproofed foundations, such as mildew of food-products and other stores, bacterial disease culture environment, and metallic disintegration, can be materially lessened, and even abolished by the proper selection and intelligent use of a suitable waterproofing compound.

This claim is broad. It sounds a little visionary, possibly as theoretical as the claim of a cement manufacturer's advertisement: "Concrete when properly made is water-tight"—of course it is when . . . ! But the writer's simple tests have made one convert to faith in waterproofing compounds.—from "Architecture."

Mr. Emerson G. Goodale, of the contracting firm of E. Goodale & Son, Hamilton, died at his residence in that city recently after a short illness. Deceased was 57 years of age and was born at Glanford, Ont.

New Ideas in Concrete Highway Design

Scientific Procedure Based Upon Ascertained Facts is Replacing Trial and Error Method—The Question of Steel Reinforcement as an Aid to Strength

By H. ELTINGE BREED
Consulting Engineer, New York City

The title contains an implification which is an admission—we are not satisfied with the roads we are building. Trend means change in a certain direction, and change involves two factors: inadequacy in present results; and new conditions requiring new adaptation of means to end. The end, or purpose, of roadbuilding is transportation; the means are the vehicles on the road. The new condition arising is the great increase of motor traffic for the transportation of freight and of passengers. Under this tremendous, destructive traffic, costly roads are disintegrating. Obviously, our present roads are in many cases inadequate. What are we to do? The answer would seem simple. We can estimate with fair accuracy the future traffic over a new road. Design that road of sufficient strength to endure it! That, from an engineer's standpoint would be entirely practicable, but not from the taxpayer's to whom the cost would be prohibitive. He must steer between Scylla and Charybdis—the Scylla of demonstrably heavy enough design at too great cost, and the Charybdis of false economy in squandering labor and material upon roads that will go to pieces before they are paid for.

Our problem then which underlies the present trend of design is to plan roads that will sustain heavy traffic and yet last at least during the term for which they are bonded, repaying to the taxpayer in accrued wealth that which is spent upon them. Briefly, we are experimenting, formally at experiment stations, practically on every bit of pavement we lay, to find out how to build the best possible road at the least possible cost. Here are the results so far in respect to the concrete road, to the discussion of which my paper is limited.

Getting Down to a Basis of Facts

Underlying the whole trend of design is the effort to oust the trial and error method by establishing scientific procedure based upon ascertained facts.

1. Fundamental to design of a road is consideration of the load it must carry. Theoretically and practically, street regulation of loading is essential in order that we may know for what we are designing. Tests made at the University of Maryland, Purdue University and by the Illinois Division of Highways, give us a scientific basis for procedure by proving beyond reasonable doubt that concrete pavements will last indefinitely under repeated loads not exceeding half the modulus of rupture of the concrete.

2. A second step towards the scientific design of pavements is the plan newly adopted in Illinois and formerly tried in Arizona and California. It marks the change, based on tests and mathematical analysis, from the slab thicker in the middle and thinner at the edges to one thicker at the edges and thinner in the middle.

3. With less scientific accuracy but persistent practical development is the use of longitudinal joints in concrete slabs held together by dowels.

4. To these changes in design I would add a fourth about which there has been less discussion. With no scientific accuracy at all, but increasing in use, partly as a hope, and partly from proof in service, is reinforcement with steel. In order to overcome the weakness from cracks two methods have been followed: one, increasing the thickness of the slab; two using steel reinforcement. Both are justified within certain limits by service conditions. From the results reported on test actions of road increased thickness has unquestionable advantage. The use of steel in these experiments has not been extensive enough to warrant drawing conclusions.

Steel has, however, been used by practical highway engineers trying to overcome that tendency to weakness in the concrete which is ascribed to lack of tensile strength. The amount used has not been based on calculated stresses but has been determined by results gained from use under service. The use of what in the design of a building floor would be reasonably adequate percents is precluded by the relatively high cost of steel in the design of a pavement. Nor are such large quantities justified in the pavement as are in the floor, for failure in the latter might result in loss of life, whereas breaking of the former causes, at worst, increased maintenance or replacement.

The Effect of Reinforcement

Reinforcements of all kinds and conditions have been tried, each highway engineer using that style and weight which is most convincing to him either as indicated by test or by service conditions; such as smooth or deformed bars, expanded metal welded or woven mesh fabrics and structural shapes or a combination of these; weights from twenty-one pounds per 100 sq. ft. to 150 pounds per 100 sq. ft. with a percent of this in corner reinforcement; dowels; across the ends; along the edges and along the centre. In direction, the main members run across the slab with the secondary members at right angles or longitudinally along the pavement or vice versa. The ratio of main to secondary member may be anything chosen in the same manner as the style and weight, etc. Why are we so far at variance? Because the conditions for design are indeterminate, and because in order to design we must have something more than a set of variables between uncertain limits on which to predicate such a design. First, we must know the amount, kind and method of application of loads; second, the physical and chemical properties of the materials in combination; third, the condition, permanency, and distribution of supports. The first and second of these are easily determined. Our load limits, their application, etc., have been studied as well as the physical properties of concrete under stress and fatigue. The third I will discuss later.

Experience shows that cracks will come even though reinforced with much larger quantities of steel than are at present used. Service conditions, however, show a smaller number of cracks when rein-

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Presented at the annual meeting of the American Concrete Institute forcement is used, even though uneconomical when considered in this light alone. It is certainly useful because we can by the use of steel cut down the distance between the cracks, and while the aggregate width of cracks will not be apparently reduced, the individual openings will be proportionately smaller, so small in fact as to prevent vertical movement between adjacent parts— for the broken faces are sufficiently rough to remain interlocked. While the theory from which the above statements were evolved may be open to question as are all theories predicated on empirical formulus, actual results under service conditions bear out the result of the theory. It is certain that after cracks are found the metal is beneficial. Its initial investment within limits is justified by the saving in maintenance and by increased life.

In addition to these four major changes, regulation of traffic, thickening of edges, dividing longitudinally, and strengthening with steel, there are many minor ones not yet sufficiently developed to make immediate discussion of them profitable.

Important to us among these minor changes is the pouring of cracks in concrete pavements with the new compound joint filler invented by the Bureau of Public Roads. It is a combination of resin, rubber and barium sulphate, promises excellent wearing qualities and does not disfigure the pavement because, being the same color as the concrete, it is barely discernible.

With the fundamental principal underlying the trend of design illustrated in these changes we must all be in thorough agreement, for engineers by grade of their profession are essentially constructive, combining the spirit of the artist and the scientist, accepting from the former the goal of Perfection, from the latter the goal of Truth. There are few of us, however commercially minded we may be, who, in designing a new road for a community, do not envisage for it greater beauty of life; and not one, I think, who would not secure his vision upon a basis of established facts. But in our very eagerness to accept facts upon which to build we need to scrutinize truths which may be misleading because they are incomplete. Sponsors of such findings are usually zealous in proclaiming their limitations but even their cautions may not offset the general human tendency toward mental laziness, easily to accept them as final. I say this the more earnestly because there is a very real danger that, in taking decisive leaps, we may so discourage the production of certain materials through disuse as to prevent further evperimentation along lines of their possible contribution to road building. How much the material producers have furthered our knowledge of road building is beyond calculation.

Unbalanced Loads

Limitation of loading sounds like easy elimination of the most important variable in our problem of calculation. Actually it is of the greatest help, but it is not final. Who has not seen a 10-ton truck with its load so placed that three-fifths of its weight comes upon a rear wheel with a defective tire? In a spring thaw on the soft subsoil, even the thickened edge of a concrete slab might crumble under it.

The shift in balance of force from middle to edges leaves still unsolved the necessary strength in the middle.

Convenient as is the building of roads in longitudinal sections, it is by no means certain yet that they will be freer from cracks, or that the dowels themselves may not become sources of destruction.

The use of steel in sufficient quantities for actual reinforcement would cost $16,000 a mile, while in smaller quantities its use is problematical in respect to quantity and in proportion of advantage gained to money spent.

These considerations lead us back to a pertinent and pointed but easily neglected paragraph in Engineering News-Record, pp. 54 and 57, Jan. 11, 1923

Development in Design—Advance in road design has been largely confined to the pavement slab. In all states there seems to be general satisfaction with the present grade cross-sections and finish. Use of standards is the prevailing custom. Very few states as general practice design roadbed for the specific project in hand or to meet the local variations in soil, drainage and location. To repeat, highway engineers appear to be satisfied with their present standard roadbed designs.

Appearances to the contrary, I think we are not satisfied with our roadbed design, and that we have not considered it nearly enough in relation to the design of the pavement slab. Realization of this, though it has had as yet no overt expression, is today I believe one of the most important factors in the trend of highway design.

Four Ways of Designing

Heretofore, concrete roads in general have been designed in four ways: first, by copying a specification and typical section that was under observation or had had a successful outcome; second, by modification of a partially successful type through correcting the weak points developed in service; third, by special design to meet some of the factors in the immediate problem; fourth, by a combination of all three methods. In none of these methods as far as I know has there been a serious attempt at estimating accurately the total strength of the road as the result of roadbed plus paving slab. Many tests are demonstrating the exact strength of the slab, but so far we have no accurate gauge by which to measure the bearing power of the subsoil. We have guessed at it, and designed accordingly. Many experiments are now being carried out to determine the supporting power of subsoils with varying degrees of moisture, but their results indicate such a wide range of values that we are confronted by two extremes; either we shall pay much more attention to the roadbed, or we shall pay none at all.

As far as I can ascertain the influence upon design of considering the relation between the roadbed and the paving slab is likely to develop in these two opposite directions.

In the first case, before designing a road at all, the engineers will make a much more thorough study of drainage and subsoil conditions and bearing power of the subgrade. Then we will design, not in terms of miles or even hundreds of feet as we do now, but in terms of slab units, proportioning the strength of each slab to the support it receives from the foundation. Thus, across a stretch of swampy ground the slabs might be designed 9-in. thick with steel reinforcement equal to that of a building floor founded on supports, while 200 ft. further on, up the sharp ascent of a hill, the slabs may be only 6 in. thick with slight reinforcement. The high cost of the slabs on unstable soil would be levelled down by the low cost on the firm soil until the average cost of the road would not exceed that of the so-called "average" road today, where slabs on poor soil may go to pieces because of insufficient bearing power, while slabs of the same strength on good soil are over-designed for the demands upon them. Concrete paving slabs, no more than individuals, can follow a standardized pattern. The service to the community of both slab and individual depends upon the environment in which it finds itself. Our effort in this direction will be to find the perfect adjustment of the slab to its foundation in order to secure the needed strength. Here, then, we are seeking the closest possible relation between the design of roadbed and the design of the paving structure.

The Roadbed not Considered

The second tendency is the opposite extreme of this, ignoring completely the mean rut in which we have been travelling. It is to leave the roadbed entirely out of consideration, and with regard for economy, devote our energy to getting a pavement structure that per se will sustain the demands of traffic upon it. This is the line along which Prof, Elmer Hooper of New York University has been working and he has permitted me to present to you here some of his results. I now quote from him:

"The usual percentage of steel is so small that it is readily acknowledged by most engineers to be of little value in load distribution. Its specified purpose is therefore limited to temperature resistance, bond between adjacent units to prevent vertical and horizontal separation, and strengthening of relative weak local areas such as corners and unsupported edges. Of these only the temperature stresses seem determinate and at first thought it might appear possible to make calculations to fix the amount of steel to keep intact a predetermined length of slab. It is unfortunate, however, that when stresses develop from temperature change there is very likely to exist at the same time severe stresses from passing loads which, though not causing any increase in the resultant axial stress do cause such a distribution of it as to over-burden andl rupture those fibres farthest removed from the neutral axis. When the crack starts it has to continue because of the reduced area to resist. Calculations on this basis are therefore of doubtful value. To develop a pavement of positively known qualities it is necessary to make determinate the nature and condition of supports. If and when that condition is established there is no logical reason why a design may not be developed, along the same lines as a bridge or building. It would not be necessary to use such low unit stresses for calculation of a pavement unit since it would not involve serious danger to life and property in the event of failure of a unit. Use of high unit stresses would make possible this type of construction as the quantities would not compare unfavorably with those of present types. Economy would be obtained even with a higher first cost, due to certain long life, due to low maintenance on pavement proper, and due to convenience from continuity of service.

"Along this line the writer has evolved a plan of design and construction which has for its purpose to satisfy the conditions just discussed. The point of most importance is that the pavement is made up of units, each supported at three points. The supports are solid and carried below frost. Each support carries the ends of one or more adjacent units. Adjacent edges are designed to interlock to make adjoining slabs mutually supporting. It may be readily seen that with this method of support a slight settlement of one end will cause no appreciable change in designed stresses. A tentative design has been worked out in detail, with the idea of making the construction simple, uniform, and in consequence not too high in first cost to make it compare favorable with the present types and designs.

No Load on Subgrade

"In the plan proposed, the subgrade will carry no load though under excessive deflection there may be contact. There will, therefore, always be a sag or tendency to sag between supports, due to dead weight as well as to live load. The top surface will be always in compression and therefore not subject to cracking. The bottom will always be in tension, so reinforcing metal would logically be used in sufficient amount to develop the full compressive strength of the concrete. Since the supports may be considered as permanent, the moments and shears for given loads may be calculated, and verified by experiment if necessary, with the assurance that conditions will not alter values. From this data the proper section of concrete as well quantity and position of steel can be determined.

"The only reasons for the pavement to become inadequate or obsolete are undue reduction of thickness before putting on a wearing surface, or increase in the allowable loading to be carried. Beyond that there is no evident reason why the construction should not last indefinitely.

"Other ways of meeting the necessary conditions of design may be developed and in them the design will certainly call for steel in combination with concrete, in such a manner that it will conform to the strict definition of 'reinforced concrete.' The essential factors for success in any plan are workability and reasonable costs. Since unit cost of steel is high compared to concrete it is necessary that there be just enough of the metal to serve the desired purpose, and no more, in order to obtain the reasonable costs."

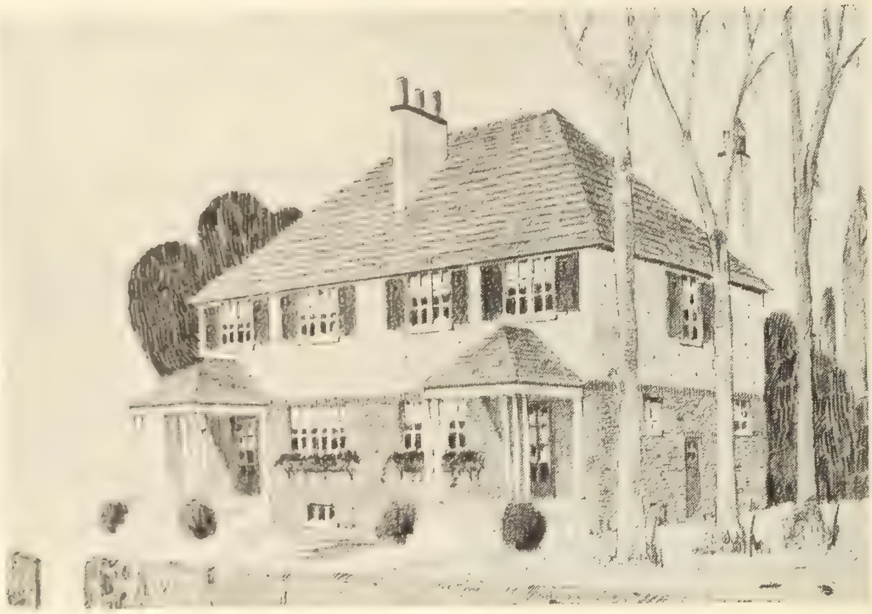
That is Professor Hooper's contribution. It suggests, I think, one line along which very definite progress may be made. In similar devices for an independent surface structure and on the other hand in the closer relation between roadbed and pavement we shall I believe, follow the future course of highway design.

Canada's Trade Conditions

Figures for the total Canadian exports and imports for the fiscal year ended March 31, 1923, have just been published by the Department of Trade and Commerce, Ottawa. Export trade developed to a greater extent than imports. Exports of Canadian goods amounted to $932,229,443 and imports to $802,457,043, a balance on the right side of $129,772,400. These figures represent an increase for the year as follows: in exports, $191,988,763; in imports, $54,694,959 and in favorable balance $137,293,804. The largest item on the export list is agricultural products; these amounted to a value of $383,425,251. The second item in order is wood, wood products and paper valued at $328,758,205. These two items, it will be seen, account for approximately three quarters of our export trade.

The Contract Record's

Weekly House Suggestion No. 67

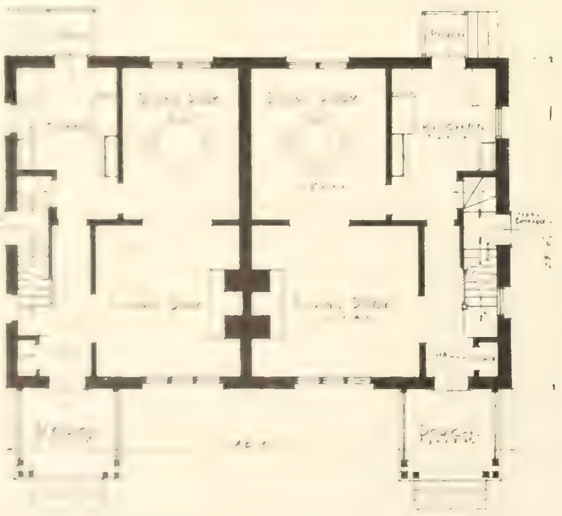


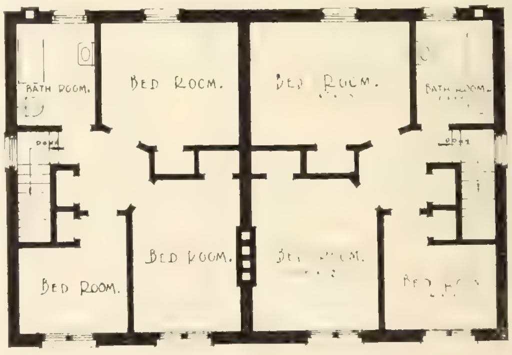
We are showing this week a pair of well-designed semi-detached homes, by Mr. Walter Stuart Pavey, architect, of 380 Richmond St., London, Ont., erected at Toronto for Mr. E. C. Warren. The reasonable cost of this class of home is a feature that appeals to the prospective builder and the pair illustrated show the possibilities for attractiveness in the exterior appearance of the semi-detached type of residence. These two houses were built at a total cost of $12,000.

The foundation walls are of 18" stone to grade, the walls above being of 9" Cooksville shale brick finished with gray stucco on the second floor. Roofing is of B. C. shingles, stained a dark brown, the shutters and flower boxes are painted green, and the verandah and window sash are finished white.

The interior layout, as shown in the accompanying plans, requires little further explanation. The rooms are all of wholesome size and provided with an abundance of natural light. Flooring throughout is of oak.

The basements are full size and in addition to space for hot water heating plant in each, they have laundry, coal and storage accommodation.





Mainly Constructional

East and West—From Coast to Coast

The cost of the program of improvements being undertaken at the present time at the Windsor Hotel, Montreal, will amount to $750,000 when completed. These developments include the building of a new coffee house at the corner of Peel and Dorchester streets. New furniture and furnishings for the rotunda, corridors and foyer will cost $90,000.

The program of construction work planned for this year by the Toronto Transportation Commission will involve the expenditure of approximately $5,000,000. This does not include the $2,500,000 for the rehabilitation of the Toronto Suburban tracks in West Toronto. The work to be undertaken includes trackwork, $897,925; special work, $333,475; rerouting and track work, including special work at Bay, Yonge and Victoria streets, Front and Spadina, McCaul and Dundas, King, Queen and Roncesvalles, $436,720; miscellaneous track work, $175,440; car house layouts, Roncesvalles and Lansdowne, $328,090; overhead construction, $275,000; land loops, Coxwell yard and for dump, $160,000; buildings, Roncesvalles avenue car barns, Russel, Lansdowne and lavatories, $620,100; sundry miscellaneous equipment, $21,250.

A report from the West states that a plant will be erected this year on the tar sand leases near McMurray, Alta., which will produce two hundred and fifty barrels of oil per day, the company who are planning this building having already applied for a provincial charter.

York Township, Ont., is experiencing a great building season this year, the volume of construction work even surpassing last year's record. Well over $3,000,000 worth of work has been undertaken during the first four months of this year, with house building playing a prominent part. Although this activity extends to every section of the township, it is especially marked in the Woodbine and Danforth Park district.

A two year extension was granted by the Federal Government recently for the taking up by the provinces their share of the Federal grant for road building purposes. It was clearly intimated, however, by the mover of the resolution for the extension, Hon. George P. Graham, that after this $20,000,000 loan has been taken up by the provinces, there will be no more Federal grants for road building purposes, the government feeling that the provinces must take full responsibility for matters of a provincial nature and ruling that roads come in this category.

The real estate firm of Huston-Neil Company have leased land with a frontage of 295 ft. on the Lake Shore road, near Toronto, to Edward Brooker. This property has a 650 ft. frontage on the lake and it is reported that this frontage will be developed into a modern bathing beach, with up-to-date dressing room accommodation and all conveniences for aquatic sports, while a huge dance pavilion will be built on the highway frontage, to cost $30,000. Other buildings included in this development will be a restaurant, delicatessen, amusement booths and service station.

The construction of the new St. Andrew's College buildings near Toronto will be commenced next fall. The site for the new college is on the east side of Yonge St., just north of the city limits. The first step will be the erection of two residences and a school building, the former to accommodate 70 boys each, while the latter will contain an assembly hall and classroom accommodation for 320 pupils.

Immediate construction of the Montreuil township road, which is to go through the centre of Quebec's new gold field from Mattawa Ville Marie as far as Lake Opasatika, was provided for in orders issued recently by Hon. J. E. Perreault, minister of mines. The road will most likely be completed before the season is over, as orders given provide for work being started as soon as weather conditions permit.

An immediate start is to be made on the large extension to the Robert Simpson Company's departmental store at Toronto. The new structure will provide an additional two acres of floor space and will be erected immediately at the rear of the present building and will rise one storey above it. The general contract has been let to the Jackson-Lewis Co. Ltd., of Toronto, and the steel contract to McGregor & McIntyre.

The London Life Insurance Co. will erect a new $250,000, seven-storey office building, to house their Toronto offices. The building is to be located on a site, 52 x 180 feet, recently purchased by them on the north side of Bloor St., west of Yonge St.

Estimates of road expenditures this year in the province of Quebec fall far below the actual figure expended last year on new roads, repairing, etc. The figure spent last year was, roundly, $11,000,000, while this year's estimates total $5,000,000, divided as follows: $500,000 for new roads; $1,500,000 for the completion of roads already started; $2,000,000 for maintenance, and $1,000,000 for resurfacing.

Messrs. Roberts Bros., builders, of 241 Dovercourt Rd., Toronto, have commenced excavation on a property acquired by them at the corner of Bloor and Quebec avenues, where they propose erecting two new apartment houses, valued at $100,000 each. The buildings will overlook High Park, and are to be separate, though adjacent to one another. They will contain 15 five-roomed suites apiece.

Northern Ontario will receive from the Dominion Government a grant of $5,000,000 this year, for road building, colonization and loans to settlers.

The presentation of diplomas to graduates of the Faculty of Applied Science, University of Toronto, took place recently, over 200 men being in the class.

Total permits issued at Toronto last month were valued at $3,331,000, compared with last year's figure for the same month of $3,555,000. Included in last month's figures were 458 permits for houses, valued at $1,818,300.

The London & Port Stanley Railway Commission, headed by Sir Adam Beck, are making strong representations to Sir Henry Thornton for a new and up-to-date terminal for the city's railway as promised the city by the G.T.R., but never carried out.

Personal

Mr. E. Latourelle, architect, of Montreal, has moved his office from 103 St. Francois Xavier St. to 43 Place D'Armes Hill.

Mr. H. L. Fetherstonhaugh, architect, of 85 Osborne St., Montreal, is moving his office to 364 Dorchester St. W.

Mr. C. E. McDonald, who has been secretary of the Engineering Alumni Association of the University of Toronto since its inception, has resigned to take a position with the Electrolytic Alloy Company, of Morristown, N.J. Mr. McDonald was tendered a banquet at the King Edward Hotel on Saturday evening, April 28. Among the speakers present at the banquet were, Sir Robert Falconer, Mr. Justice Masten, Messrs. T. A. Russell, E. P. Brown and F. J. Lyle. Mr. Walter J. Francis, president of the Engineering Institute of Canada, presided.

Obituary

Mr. Henry Carveth, well known builder of Peterborough, Ont., died in that city recently in his 80th year.. Deceased had been a resident of Peterborough practically all his life and built many schools and public buildings there.

CONSTRUCTIONAL ACTIVITY

Period of May 2 to May 8, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Acton Vale, Que.

Separate tenders are being received by the Council, A. Beaudoin, secretary, for the following waterworks supplies until May 21: 1. Pumping station and mechanical gravity filters; 2. Steel tower and tank, capacity 1,000,000 gallons; 3. Piping of aqueduct with 2,450 feet of 12 inch cast iron pipe.

Brantford, Ont.

Plans are being prepared for the City for sewers by MacKay & MacKay, 72 James St. North, Hamilton.

Burlington, Ont.

MacKay & MacKay, engineers, Home Bank Bldg., are receiving tenders until noon May 17 for paving Brant street between Caroline and Freeman Sts., with either concrete or bituminous penetration pavement, also Brant St. between Water St. and Caroline St., similar specifications.

Chilliwack, B. C.

Tenders will be received by the Municipal Council until May 19 for gravelling roads in the Township of Chilliwack. Particulars may be secured from S. Leslie Brice, clerk, Chilliwack.

At a cost of $10,000 the Elk Creek Waterworks Co., Chilliwack, will extend its service about a mile along the Prairie Central Road, using wood stave wire wound pipe.

Cobourg, Ont.

James, Proctor & Redfern Ltd., 36 Toronto St., Toronto, are receiving tenders for bituminous pavement, concrete base, for William and George Sts. Approximately 14,000 sq. yds. of roadway is to be paved.

Cornwall, Ont.

J. G. Harkness, Town Clerk, is receiving tenders on the paving of Second St. between Marlborough and Cumberland Sts. with bituminous concrete on a concrete base, until May 14. The cost of this work is estimated at $100,000.

Crossfield, Alta.

Concrete sidewalks costing $30,000 are contemplated by the Village Council. Tenders will be called shortly. W. McRoy, treasurer.

Eastview, Ont.

Pipe required for watermains on various streets, costing $22,600, will be purchased by the Town in the open market.

Edmonton, Ont.

Tenders will be received by the City of Edmonton, until June, 4, for the supplying of 2,300 ft. of class "C," 20 in. cast iron pipe. Tender must include delivery f.o.b. Civic Yards. Commissioner of Works is C. J. Yorath.

Elora, Ont.

Preliminary steps are being taken by the Village Council preparatory to laying pavements on the streets in Elora forming the connecting link in the Provincial County Road No. 68. This work will be completed this year. J. A. Thompson, Warden.

Espanola, Ont.

Spanish River Pulp and Paper Co., Espanola, contemplate paving the roads on Spruce and Meade Sts. Spruce St. pavement will be about 1,634 ft. long, 33 ft. wide, 8" crushed stone base and asphalt top. Meade St., 2,944 ft. long, 33 ft. wide will be paved with the same material.

Grand Mere, Que.

Mr. Elwood Wilson, Laurentide Paper Co. Ltd., is raising funds to finish the road between Riviere Cache and Grand Mere with an asphalt top. This work is estimated to cost $80,000.

Guelph, Ont.

Tenders for grading "Exhibition Park," addressed to W. P. Evans, Chairman of Parks Committee, are invited until May 16. This work includes grading about 8.3 acres at the north and west ends of the Park. H. S. Nicklin, City Engineer.

Leamington, Ont.

Tenders for one mile of reinforced concrete pavement, eighteen feet wide, from Erie St. to Bevel Line, will be received by W. P. Coyle, Essex County Clerk, Sandwich, until May 25.

R. M. Selkirk, Town Clerk, is receiving tenders for one mile of re-inforced concrete pavement until May 25. This road will run from Erie St. to the First Concession Rd.

Mimico, Ont.

C. J. Telfer, Town Clerk, will receive tenders until May 21 for laying approximately 6,000 sq. yds. of bituminous pavement on a concrete base. Plans and specifications with the Town Clerk and W. B. Redfern, 1004 Excelsior Life Bldg., Toronto.

Regina, Sask.

Tenders are being received by the Provincial Highways Department, H. S. Carpenter, Deputy-Minister, for the construction of the following roads, until May 16: Stockholm to Dubuc, Fairlight to Wawota and Glen Ewen West, 14½ miles.

The City Engineer will buy 10,000 feet of 6 in. tile sewer pipe for house connections as required. An expenditure of $2,700 for this material has been passed.

Richelieu Village, Que.

L. Bessette, secretary, is receiving tenders for the Village Council until May 15 for excavation and repairs to sewers, totalling about 3,100 feet. Plans and specifications are with the secretary and Beaurgard & Labelle, 90 St. James St., Montreal.

Schomberg, Ont.

This summer storm sewers will be laid on the main street and a section of the road, about a mile long, will be paved as a Provincial Highway.

Tillsonburg, Ont.

Eight hundred feet of water mains and two hydrants are contemplated by the Fire and Light Commission. A. E. Simons, chairman.

The Town Council has not yet purchased the material for a Tarvia macadam road, with curbs, to be laid by day labor, at a cost of $17,000. M. Ostrander, Street Commissioner.

Toronto, Ont.

Tenders for the following concrete sidewalks for Scarboro Township are being received by C. G. Fraser, 1361 Kingston Rd., until May 14: No. 1 Byng, Mansion, Kenworthy, Leyton, Madeline and Robinson Aves. and Ellward Blvd.; 2 Woodrow Blvd., Preston St., Maxwell Ave.; 3 Cornell, Queensbury, Lakeside, Hain and Eastwood Aves., Ballahula Blvd., Kingston Rd.

Tenders for the following pavements are being received by the City until May 15: Asphalt Pavements— Alpine, Ashland, Burnside, Brandon, Chambers, Earlscourt, Coxwell, Evans, Howick and Iona Avenues, Fourth St., Glebeholme Blvd., and Glenmannor Drive. Asphalt and Brick Block Pavements—Glenmannor Drive east and west. Bithulithic Pavements—Alton, Ardagh, Battenburg, Beck, Beresford, Fawcett, Thorncliffe, Avenues, Durie St. and Glebeholme Blvd. Concrete Curbs—Alton, Ashland, Battenburg, Brandon and Fawcet Avenues. Concrete Pavements—Lane, 1st west of Markham St. and Lane, 1st south of Richmond St.

Victoria. B. C.

The Minister of Public Works is receiving tenders on the construction of the Edgewood-Vernon Road, from Deep Creek, 4.3 miles west, until May 14.

CONTRACTS AWARDED

Acton, Ont.

The Town Council has awarded the contract for rebuilding a dam and building a new waste way to N. Forbes. Prices are wanted on cement.

Brantford, Ont.

The McNamara and Thornton Construction Co., Sault Ste. Marie, which has the general contract for work on the Brantford-Paris Road will commence operations on the Brantford section of the Highway about May 20.

Burlington, Ont.

The contract for a sewerage pump for the Town has been awarded to J. Sinclair, 867 Lansdowne Ave., Toronto, by the Council. McKay & McKay, Home Bank Bldg., Hamilton, engineers.

Oshawa, Ont.

Standard Paving Co., Central Chambers, Ottawa, are top-surfacing Gliddon Ave., Huron St., Taylor St. and Clark St. and are laying about 2,000 feet of curb and gutters.

Port Hope, Ont.

Town of Port Hope will construct sewers on the following streets this year: Dorset St. East, Ontario St., Hope St., College St., Harcourt St., Robertson St., G.T.R. right of way and Park St. Funds necessary for this work will be borrowed from banks.

Toronto, Ont.

Further details of contracts awarded for roadwork by the Provincial Department of Public Highways, are given on page 433, of this issue.

The City of Toronto has awarded the following contracts for paving: Asphalt—Meagher Ave., $2,601 and Oakdene Cres., $7,291, Kilmer & Barber, 24 Adelaide St. West; Campbell Ave., $4,108, Indian Rd., $8,677, Primrose Ave., $18,778, Symington Ave., $5,279, Wade Ave., $6,845, Construction & Paving Co., Confederation Life Bldg.; Carrick Ave., $3,149, Copeland Ave., $4,721, Eighth Ave., $13,437, Haig Ave., $7,935, Hanson St., $8,234, Kenwood Ave., $2,733, Keystone Ave., $5,539, Linsmore Cres., $4,651, Rosemount Ave., $6,072, Commissioner of Works. Asphaltic Concrete—Drofnas St., $4,486 and Glenlake Ave., $14,569, Commissioner of works. Bithulithic—Bingham Ave., $9,384, Hammersmith Ave., $3,354 and Oak Crest Ave., $8,724, Warren Bituminous Paving Co., 54 University Ave.; Aldridge Ave., $8,893, Bingham Ave., $15,412, Bracken Ave., $10,220, Cambridge Ave., $6,014, Chester Hill Rd., $19,646, Durie St., $7,736, Fairmount Cres., $12,825, Hammersmith Ave., $9,131, Harris Ave., $16,272, Mount Royal Ave., $13,402, Pryor Ave., $5,227, Rosethorn Ave., $8,632, Strathmore Blvd., $18,686, Swanwick Ave, $7,426, Commissioner of Works. Concrete Curbing—Eighth, Glenlake, Haig and Hanson Sts., Meagher, Mount Royal and Primrose Aves., Oakdene Cres. and Indian Rd., Asphaltic Concrete Co. Ltd., Excelsior Life Bldg.; Bingham and Campbell Aves., Commissioner of Works. Concrete Sidewalks—Atlas, Slade, Woddington Aves., Bowmore and Chesterhill Rds., Coxwell Ave., Glebeholme Blvd., Glenholme Dr., Murray Contracting Co., 8 Wychwood Pk.; Evelyn and Glendonwynne Rd., Grant Contracting Co., 50 Front St.; Balance, Commissioner of Works.

Victoria, B. C.

The general contract for roadwork for the city, costing $52,688, has been awarded to the Cotton Co. Ltd., Falsecreek. F. M. Preston, Victoria, engineer.

Winnipeg, Man.

Thos. Jackson & Sons, 370 Colony St., have the general contract for granolithic walks for the city costing $11,518.16.

Railroads, Bridges and Wharves

Bridgeburg, Ont.

Addressing a Bridgeburg Committee, headed by Mayor M. C. Williams, Sir Henry Thornton intimated that he would look into the project of re-building the Internation Railway bridge, with driveways. Sir Henery said that financial stringency has compelled this work to be deferred.

Ottawa, Ont.

R. C. Desrochers, secretary, Department of Public Works, will receive tenders until May 22 for the reconstruction of the superstructure of the timber pilework wharf at Blind River, District of East Algoma, Ont.

Oshawa, Ont.

The Town Council contemplates extending tracks on Simcoe St. from Alexander St. to the Town Limit, a distance of about ½ mile. If this work is done the road over the entire distance would have to be repaired.

St. Stephen, N. B.

The International Bridge across the St. Croix River, between Milltown, N. B. and Milltown, Me., collapsed last week causing a heavy loss.

Windsor, Ont.

It is the intention of the Hydro-electric Power Commission to spend $1,000,000 on improvements to the border railway system. Windsor City Council recently passed by-laws which will allow the Commission to proceed with its work.

CONTRACTS AWARDED

Brampton, Ont.

The Town Council has awarded the general contract for the new bridge over the Etobicoke Creek to H. G. Healy, Brampton, at $9,283.55.

Public Buildings, Churches and Schools

Brampton, Ont.

Burden & Gouinlock, 110 King St. West, Toronto, are receiving bulk and separate tenders on a two storey school. 60 ft. x 80 ft., of brick construction, costing $65,000. May 18 is the closing date for tenders on this building.

Cochrane, Ont.

The Provincial Department of Public Works, Toronto, contemplates a new Courthouse. H. F. McNaughton, secretary.

Haileybury, Ont.

Plans have been prepared and tenders will be called shortly for an hotel costing $25,000 of concrete and brick construction. P. Fleming, owner, will receive the tenders.

Hamilton, Ont.

Witton & Walsh, 7 Hughson St., architects, are preparing plans for alterations to St. Joseph's Hospital.

Hornepayne, Ont.

Tenders for a school, four rooms, are invited by M. W. Tompkins, secretary of the School Board, until May 16.

Lakeview, Ont.

Fred Cubbidge, 685 Windernere Ave., is receiving tenders on electrical work, plastering, plumbing and heating for a four roomed school at Lakeview.

Montreal, Que.

Tenders will be called in about two weeks by the Protestant School Board, 36 Belmont St., for the erection of a school costing $250,000. J. S. Archibald, 314 Dorchester St., architect.

Tenders for "Pierre Claver" school, containing 16 classrooms, for the Catholic School Commission, East District, 191 Stadacona Ave., will be called in June. J. M. Manning, secretary.

Mount Dennis, Ont.

A $25,000 Church and Sunday School will be built by Mount Dennis Methodist Church. The architect has not yet been appointed. Rev. R. H. Nixon, interested.

Mont-Joli, Que.

The erection of a fireproof church costing $250,000 is contemplated by the parish. Rev. J. E. Guerin, curate, Pierre Levesque, architect, 115 St. John St., Quebec.

Newcastle, N. B.

F. N. Brodie, 42 Princess St., St. John, is receiving tenders on a three storey school, 65 ft. x 85 ft., brick construction, costing $80,000, until May 21.

Rigaud, Que.

Sisters of Ste. Anne, Rigaud, contemplate a five storey convent, 40 ft. x 60 ft., costing $15 000.

St. Ephrem D'Upton, Que.

Plans have been prepared for a 60 ft. x 85 ft., addition to the convent and tenders will be called shortly. Rev. Dutilly is interested in this work.

St. John, N. B.

Tabernacle Baptist Church will erect a $50,000 church. The building at present occupying the site will be wrecked. Harry A. Mallory, 24 St. David's St., St. John, will be in charge of this work.

St. Vital, Man.

Tenders will be called soon for a two storey school, 59 ft. x 100 ft., of concrete and brick construction, costing $60,000. J. M. Lethbridge, 434 Somerset St., Winnipeg, architect; J. Goodwin, 295 Sadler St., St. Vital, secretary.

Sudbury, Ont.

Joseph Fowler, Secretary of the Public School Board, will receive tenders for a four-room addition to the College Street Public School until May 18. Plans, specifications, and other necessary details may be had from the architect, P. J. O'Gorman, Stafford Building, Sudbury.

Toronto, Ont.

Plans will be prepared and tenders called by the Board of Education for additions containing six rooms for Lansdowne and Ogden schools.

The congregation of St. Saviour's Anglican Church has decided to erect a Parish Hall costing $12,000 and will call for tenders on this project next week.

Toronto Transportation Commission is receiving tenders for the construction of Roncesvalles car-house until May 18. This structure will be of reinforced concrete, 285 ft. x 135 ft., with a brick office building, 118 ft. x 42 ft. Tenders must include all plumbing, heating, electric wiring, sprinklers, rolling steel doors, [illegible] Plans and specifications are at the [illegible] Department, 3rd floor, 35 [illegible] St.

Parkdale Canoe Club will re-build the club house destroyed by fire. The site will be cleared at once. H. H. McKee, [illegible] Ave., Commodore. The [illegible] for the new building has not yet been [illegible].

CONTRACTS AWARDED

Arnprior, Ont.
[illegible] & Slack, Arnprior, have the general contract for the High School, three storeys, 36 ft. x 60 ft., brick construction, at $34,375. Contractors have not yet secured the material needed for this structure

Cornwall, Ont.
Alex. Christie & Son, Kensington Apts., Ottawa, have been awarded the general contract for alterations and additions to the High School costing $100,000. McKinley & Northwood, Rideau St., Ottawa have the contract for plumbing and heating.

Isle Verte, Que.
Messrs. Filion & Labrecque, Quebec, have the general contract for a rectory for the Parish costing $26,000. This structure will be two storeys high, 40 ft. x 52 ft., solid brick. O. Roberge, St. Marie, Que., has the contracts for plumbing and heating.

Kingston, Ont.
The contract for steel casements for the University Library, has been awarded to the Canada Metal Co., Fraser Ave., Toronto.

New Waterford, N. S.
W. A. Rudderham, St. Peter's Road, Sydney, has been awarded the general contract for the $70,000 hospital. Subtrades for this building will be let by the general contractor.

Outremont, Que.
A. & D. Boileau, 245 McDougall Ave., have the general contract for "Lajoie" school, costing $66,000. The contract for steel has been awarded to Phoenix Bridge & Iron Works Ltd., 83 Colborne St., and contracts for roofing, electrical, plumbing, heating, plastering, ornamental iron, marble and tile will be let by the general contractor.

Pike River, Que.
[illegible] Paquet, St. Hughes, Bagot County, has the general contract for a school, 45 ft. x 55 ft., two storeys high.

Point Grey, B. C.
The Architectural Bronze and Iron Works, Toronto, Ont., has the contracts for sash. glass and glazing, for the first unit of the $700,000 University group at $27,855.

Port Hope, Ont.
Gladman Construction Co., 79 Adelaide St. West, Toronto, has the general contract for a three storey, stone and structural steel, addition to Trinity College. The new building will be 270 ft. x 138 ft. Thos. Garnett & Sons, Port Hope, have contracts for masonry and plastering, Bennett & Wright, Toronto, have contracts for plumbing, heating and electric wiring.

Uxbridge, Ont.
The following contracts have been awarded on the $75,000 High School: Steel, Reid & Brown Structural Steel & Iron Works, Toronto; roofing, W. S. Moffat Ltd., Toronto; plumbing and heating, H. Griffiths & Co., Toronto. W. F. Hamilton, 16 Adams Ave., Toronto, superintendent.

York Township, Ont.
Contracts for roofing, asphalt floors, and sheet metal for the $80,000 addition to a public school, S.S. No. 35, have been awarded to W. A. Moffat Co. Ltd., Toronto.

Business Buildings and Industrial Plants

Acton, Ont.
A $10,000 factory for the manufacture of motor parts is contemplated by Fred Blow.

Brampton, Ont.
The Canadian National Railways will erect a two-storey brick building, eighty-two feet long on an eighteen toot site, recently acquired. This structure will contain three suites of rooms above the office, and will cost about 10,000. R. W. Lowry, agent.

Haileybury, Ont.
A Newspaper reports states that N. Servais contemplates building an hundred room hotel in this place. Mr. Servais was formerly the proprietor of the Matabanic, destroyed by the forest fires last year.

Hamilton, Ont.
James Shekter, 78 George St., will build three stores with apartments above costing $50,000, three storeys high, brick construction. A brick garage, 25 ft. x 25 ft., will also be built.

Mackay Bros., general contractors, St. Eloi Apts., are excavating for a store costing $13,500. Tenders for all subtrades will be let.

Montreal, Que.
G.Daoust, 801 Maplewood Ave., will let contracts for roofing, wiring, plumbing, plastering and stone work for stores costing $15,000.

T. Lussier, 257 Wurtelle St., is building a stable and residence, of frame and brick construction. Prices are wanted at once on pine beams. All sub-trades will be let. Structure is brick and concrete, 30 ft. x 45 ft.

Frank C. Woodroffe, Purchasing Agent, is receiving tenders on roofing, plastering, marble and tile for the addition to a store owned by Margan Realties Ltd., 473 Union Ave. The general contractor is Henry Morgan & Co., 139 Beaver Hall Hill.

Plans are being prepared for a molasses distillery costing $25,000 for the Commercial Alcohol Co. John Irwin, c/o McArthur Irwin Ltd., 20 St. Paul St., president. Tenders will probably be called about the end of May.

Newcastle, N. B.
Plans are being prepared for a store, two storeys, 50 ft. x 80 ft., brick and concrete construction, by B. A. Tozer, architect. James Stables contemplates this structure at a cost of $10,000.

Ottawa, Ont.
Ross-Meagher Co., Laurentian Bldg., are inviting tenders for all sub-trades for a $35,000 factory, two storeys, mill brick and construction.

Portneuf Station, Que.
J. Ford Paper Co. Ltd., Portneuf Station, are in the market for cement, and sandstone for a pulp mill and dam costing $200,000. The mill will be 200 ft. x 100 ft., and all work will be done under the supervision of the owners by day labor.

Vancouver, B. C.
The Bell Telephone Co., 768 Seymour St., will build a garage, 114 ft. x 122 ft., of brick and reinforced concrete at a cost of $18,000. John Johnstone, 768 Seymour St., architect.

West London, Ont.
A Syndicate, in which Geo. Little, c/o Robinson, Little Co., is interested, proposes to build an arena costing $90,000. The proposition calls for the organization of a company with a capital of $300,000. The location chosen is on Bathurst St.

CONTRACTS AWARDED

Campbell's Bay, Ont.
M. Sullivan & Son, Arnprior, have the general contract for the $15,000 hotel "Ottawa." Contracts for roofing, wiring, plastering, heating, plumbing, etc., will be let. Richards & Abra, 126 sparks St., Ottawa, architects.

Hamilton, Ont.
Contracts awarded on stores for F. Freeborne, costing $16,000, are as follows: Steel, Hamilton Bridge Works Co. Ltd.; plumbing, P. A. More, 939 King St. east, heating, McClary Mfg. Co., York St.; plastering, Thomson & Thombs, 129 Balmoral Ave., north.

Robt Fitzimmons Co. Ltd., 21 Rebecca St., have the contract for plumbing and heating for a factory for Orange Crush Bottlers. The electrical contract has been awarded to Hudson Bros., 65 Cathcart St.

Montreal, Que.
The general contract for two stores and three flats, three storeys, 30 ft. x 40 ft., frame and brick construction, has been awarded to Jas Soucisse, 1332-a Wellington St. General contractor will let sub-trades and requires lumber and all other materials.

Outremont, Que.
Jules Toralli, 186 St. Margaret St., will build a three storey, brick and concrete stable, costing $10,000, for the McEwen Milk Co. Ltd., 2826 Hutchinson Street.

Toronto, Ont.
The Ontario Foundation & Construction Co., 22 Watford Ave., will excavate for the addition to the Robert Simpson Co.'s store. Electrical work, heating plumbing will be let by the architects, Horwood & White. The general contractors, JacksonlLewis Co. Ryrie Bldg., will let all other trades.

Residences

Dundas, Ont.
Plans for a two storey brick residence, 37 ft. x 42 ft., with a concrete foundation, are being prepared for Dr. D. M.

Livingstone, Dundas, by Witton & Walsh, 7 Hughson St., Hamilton. Style of color of brick has not been decided upon. The dwelling will cost about $10,000.

Hamilton, Ont.

K. C. Beckett, 116 Charlton St., is building a one storey brick bungalow costing $9,000.

About June 1 tenders will be called by Hutton & Souter, Bank of Hamilton Bldg., for a residence costing $20,000, of brick construction, two storeys high.

Montreal, Que.

A. Pinsonnault, 106 Madison Ave., is excavating for a dwelling costing $12,000, of frame and brick construction with concrete foundations. Roofing, plumbing, heating, plastering and brickwork, will be let. Owner purchases all material.

A three storey residence, costing $20,000 with a concrete foundation of brick and frame construction, will be erected by R. Slouthier, 10 William David St. The owner will buy materials as required. Roofing, electric wiring, plumbing, heating and plastering are to be let.

M. A. Gilbert, 757 Marguette St., will let all sub-trades for a three storey dwelling, 50 ft. x 40 ft., concrete foundations, brick and frame construction.

Three residences costing $24,000 are contemplated by J. B. Lavoie, 303 Delanaudiere St. Brick, lumber, plumbing, hardwood flooring etc., have not yet been purchased. These houses will be two storeys, 25 ft. x 35 ft., with concrete foundations.

J. Gendron, 555 Deserables St., will let all sub-trades for a two storey brick, concrete and frame residence, 34 ft. x 28 ft., costing $10,000.

Two three storey residences, 27 ft. x 50 ft., concrete foundation, frame and brick construction, costing $16,000 will be built by Guertin & Dore, 2 Resther Street.

C. A. Cayoutte, 155 Boulevard Monkland, will erect a two storey dwelling, 25 ft. x 28 ft., brick and frame construction, costing $10,000. Sub-trades have not yet been let.

Three residences, three storeys, 25 ft. x 55 ft., frame and brick construction, with three garages, will be built by J.R. Lefebvre, 246 St. Antoine St., at a cost of $32,000. Materials for these hauses will be purchased as required.

Atwater Construction Co., 643 Champlain St., is excavating for an apartment house costing $90,000. The building will be three storeys high, 62 ft. x 94 ft., stone and concrete construction. Prices are wanted on all materials except rough lumber. P. Asconi is president of the company.

Z. Tougas, 155 Desery St., is building five flats, three storeys high, 30 ft. x 45 ft., frame and brick construction, costing $15,000. Contracts for roofing, wiring, plumbing, plastering, brickwork are not yet let.

Mount Royale, Que.

Sub-trades for eighteen residences being built for the Terminal Housing Co., will be let by B. St. Pierre, 3448 Henri Julien St., Montreal, general contractor.

Ottawa, Ont.

Noffke, Morin & Sylvestre, Central Chambers, have prepared plans for a three storey brick and concrete apartment house for Fred Desjardins, Charlotte St. This building is estimated to cost $50,000.

Outremont, Que.

Contracts for roofing, electric wiring, plumbing, heating, plastering, tiling and painting for a $15,000 cottage will be let by J. Blanchette, 233 Bernard Ave.

Sarnia, Ont.

Plans are being prepared for R. B. McBurner, 263 Brock St., north, for a $15,000 dwelling, 30 ft. x 40 ft., brick veneer, concrete foundation. Chester Woods, 217½ Christina St. north. No material for this project has been purchased.

Toronto, Ont.

Sydney G. Whaley, 20 Briar Hill Ave., is excavating for a $10,000 dwelling, two storeys, brick and stone construction. Sub-trades will be let by the builder. Lumber, plumbing, roofing, furnace, flooring and hardware have not yet been purchased.

Tenders on all mechanical trades for a $20,000 residence on Oriole Parkway, are invited by A. R. Burk, 18 Toronto St.

A $9,000 residence on Inglewood Drive is being built by W. C. Sancto, 21 Isabella St., who will let the sub-trades. J. Hunt Stanford & Son, 67 Yonge St. Arcade, architects.

H. B. Hamm, 392 Roxton Rd., has excavated for a $15,000 dwelling and is receiving tenders on roofing, painting, wiring, plastering, plumbing and heating.

C.M. Willmot, 283 Sheldrake Blvd., is superintending the erection of a two storey brick dwelling for J. P. Maher, 90 Barton Ave. All small trades will be let by the architect.

Verdun, Que.

J. Soucisse, 1332a Wellington St., will let all sub-trades for thirty-two flats brick and frame construction, costing $125,000. Prices are wanted at once on lumber by the carload.

Waterloo, Ont.

W. H. E. Schmaltz, 15 Queen St. south, Kitchener, is receiving tenders for a $13,000 residence. This dwelling will be two storeys high, 32 ft. x 28 ft., concrete foundation, brick construction, with electric lighting, hot water heating and hardwall plastering. Materials have not as yet been bought.

CONTRACTS AWARDED

Brantford, Ont.

J. H. Cox, 57 Victoria St., has awarded the general contract for a two storey, brick and concrete dwelling, 26 ft. x 34 ft., to A. J. Cromar, 448 Colborne St.

Dundas, Ont.

The following contracts have been awarded on a $10,000 dwelling for H. Lawson by Haskins & Co., Sydenham St., general contractors. Cut stone, Arthur Stead, 148 Central St. Hamilton; electrical, Oliver Ofield; plumbing, J. Pollard; heating, Jas. Ritchie & Co.

Kitchener, Ont.

The Star Construction Co., 90 Cameron St., has the foundations in for ten residences, two storeys, 24 ft. x 30 ft., brick, costing $50,000.

Montreal, Que.

The contracts for brick, tile, excavating and foundations for 48 brick and frame residences having concrete foundations, has been awarded to Jules Toralli, 186 Margaret St. Badgley Construction Co., 84 Mark St., are the builders.

Mont Royale, Que.

The general contract for forty-two residences, of brick and concrete construction, with hot water heating and hardwood floors, has been awarded by the Mount Royale Housing Co., Montreal, to L. A. Ott & Co., 10 Cathcart St., Montreal. H. R. Cassidy 255 Regent St., has the contract for electric wiring.

Toronto, Ont.

Foundations are going in for a $50,000 residence for C. A. Bogart, c/o M. Lylie, architect, 230 Bloor St. A. Rule, 122 Garden Ave., has the masonry contract.

Power Plants Electricity and Telephones

Brockville, Ont.

Negotiations are being carried on by the Hydro-electric Power Commission for the purchase of the Ragged Chute Water Powers on the Mississippi River, three miles above High Falls, where power is now generated for the Rideau system.

Elora, Ont.

Clifford ratepayers have carried a bylaw authorizing the installation of an electric lighting plant.

Glace Bay, N. S.

Improvements to the electrical plant, contemplated by the Town, will cost $36,000.

London, Ont.

The construction of an under ground power line is proposed by the Utilities Commission at a cost of $30,000.

Nicolston, Ont.

The Town Council contemplates a Hydro-electric system. C. Kinler and W. Taylor, Nicolston, are members of the Commission.

North Temiskaming, Que.

W. A. Fasken, Excelsior Life Bldg., Toronto, is interested in the prices of all materials necessary for the construction of a Hydro-electric plant at Ka-Ka-Ka Falls, on the Quinze River, capable of developing 20,000 horsepower. The owner is as yet undecided whether work will be done by contract or day labor.

Quebec, Que.

With the development of the rapids at the headwaters of the Quinze the Quebec Government will for the first time enforce the principle of charging fifty-cents a horsepower for electricity exported from the province.

J. E. Weyman, of the Levis County Railway Co., delivered an interesting address on the "Electrification of Railways," at a recent meeting of the Quebec Rotary Club.

Acting under instructions from the Quebec Government engineers will pre-

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

New School

[illegible] will be [illegible] until 8 p.m.

Friday, May 18th, 1923,

[illegible] school, School Section No. 2, Cornwall Township.

[illegible] be seen at the [illegible] Buildings, Cornwall [illegible]

[illegible] not necessarily ac[illegible]

JAMES R. SIMPSON
Secy.-Treas.
19-[illegible] Cornwall.

Town of Mimico

Tenders for Pavement

[illegible] marked and addressed to Mr. C. J. Telfer, Town Clerk, will be received [illegible]

Monday, May 21st, 1923,

[illegible] 6000 sq. yds. of pavement with concrete base and bituminous top.

Plans and specifications may be seen at the [illegible] W. B. Redfern, 1004 Excelsior Life Building, Toronto, or at the office of the Town Clerk, Mimico.

C. J. TELFER,
Clerk.
J. H. DOUGHTY,
19 Mayor.

Toronto Transportation Commission

TENDERS

Sealed tenders will be received for the construction of a Concrete Retaining Wall around the site of the new Roncesvalles Car House, Roncesvalles Avenue and Queen St. West, including all excavation, Concrete Work, Form Work, Re-inforcing Steel, etc., and all other work necessary for the completion of the wall.

All tenders are to be endorsed "Tender for Retaining Wall, Roncesvalles Car House" and are [illegible] Toronto Transportation Commission, and are to cover all the work contemplated and must be delivered at the [illegible] Commission, 35 Yonge Street not [illegible]

Monday, May 21st, 1923,

Each tender must be on the Commission's form [illegible] cheque payable to The Toronto [illegible] Commission for two and one-half [illegible] 2½%) of the amount of the tender.

[illegible] instructions to bidders may be obtained upon application to the Commission's Buildings Dept. [illegible]

The lowest or any tender not necessarily ac[illegible]

(Signed) H. H. COUZENS,
General Manager,
19 Toronto Transportation Commission.

RATES

20 cents per agate line (14 lines to the inch). Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

CITY OF GUELPH

Tenders for Grading Exhibition Park

Sealed tenders marked "Tenders for grading Exhibition Park" and addressed to Mr. W. P. Evans, Chairman, Parks and Buildings Committee, care of City Clerk, Guelph, Ont., will be received up to twelve o'clock noon,

Wednesday, May 16th, 1923,

for grading approximately 8.3 acres at the north west end of Exhibition Park, City of Guelph.

Plans, specifications and form of tender, may be seen at the office of Contract Record, Toronto, Canadian Engineer, Toronto and City Engineer's Office, Guelph, on and after May the 8th and form of tender obtained at City Engineer's Office Guelph.

The lowest or any tender not necessarily accepted.

H. S. NICKLIN,
City Engineer.
City Engineer's Office, Guelph, Ont.
May 5th, 1923. 19

SEALED TENDERS

Marked "Tender for Paving" will be received by me at my office until 12 o'clock noon of

Monday May 14th, 1923,

for the work of paving Second Street between Marlborough and Cumberland Streets in the Township of Cornwall. Type of construction Bituminous Concrete on Concrete Base.

1442	cubic yards excavation and back fill.
37	catch water basins complete.
4300	cubic yards excavation to sub grade.
10100	lineal feet concrete curb.
10700	lineal feet steel curb.
44500	lineal feet ½" reinforcing bars.
18260	square yards pavement.

Length of work 5237 feet.

Plans and specifications may be examined and forms of tender procured at the office of W. H. Magwood, Town Engineer.

A cash deposit, accepted cheque or Guarantee Company's bond for a sum equal to 10% of the tender price must accompany each tender.

The Municipal Council reserves the right to accept the lowest or any tender and to reject any or all tenders.

J. G. HARKNESS,
Town Clerk.
18-19 Cornwall, Ont., April 25th, 1923.

WANTED position as foreman or superintendent on construction work, on sewers, tunnels, watermains, pavements, sidewalks, macadam roads. A1. I have recommendation if needed. All kinds of construction work. Box 193, Walkerville P.O., Ontario. 18-21

Extension of Time

The time for receiving tenders for the city service ladder truck for the City of St. Thomas, has been extended to 5 p.m., May 18th, 1923.

Specifications on application to my office.

W. C. MILLER,
City Engineer.
St. Thomas, April 30th, 1923. 19

TENDERS for Special Castings

Tenders will be received by registered post only, addressed to the Chairman, Board of Control, City Hall, Toronto, up to 12 o'clock noon, **Tuesday, May 22nd, 1923**, for the following:

Tender No. 42—42-inch and 36-inch Cast Iron Special Castings.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall. Tenders must comply strictly with conditions of City By-law as to deposits and sureties, etc., as set out in specifications and forms of tender.

The lowest or any tender not necessarily accepted.

C. ALFRED MAGUIRE (Mayor)
19 Chairman of Control.

Tenders Wanted

Collegiate Institute, North Bay, Ont.

Sealed tenders addressed to Miss Margaret Bailey, Secretary, Collegiate Institute, North Bay, will be received up to 12 o'clock noon

Saturday, May 12,

for the erection and completion of a six room addition to Collegiate Institute, North Bay, Ont.

Plans and specifications may be seen at the office of the undersigned.

The successful tenderer will be required to furnish guarantee bond.

The lowest or any tender not necessarily accepted.

ANGUS & ANGUS,
Registered Architects,
Angus Block, North Bay, Ont.
18-19

QUANTITY SURVEYOR—Fully qualified in all classes of work wants position. Box 246, Contract Record, Toronto. 18-21

DEPARTMENT OF ROADS

Tender—Resurfacing

Tenders made on forms supplied by the Department of Roads and placed under envelopes bearing the words: "Tender—resurfacing," followed by the name of the interested municipality, shall be received at the office of the Minister of Roads, in the city of Quebec, Government Building, up to one o'clock of the afternoon, on

Tuesday, the fifteenth (15) of May, 1923,

for the resurfacing of macadam and application of liquid bitumen of the Main Road, length 6,888 feet, in the municipality of the village of Pointe au Pic, in the county of Charlevoix; the road of the village length 1,871 feet and Station by-road, length 3,229 feet in the municipality of the village of Ste. Thecle, in the county of Champlain.

Quebec, May 3rd, 1923.

J. L. BOULANGER,
Deputy Minister.

19

Sealed tenders addressed to the undersigned, and endorsed "Tender for reconstruction of piers at Whitby, Ont.," will be received at this office until **12 o'clock noon, (daylight saving)**

Wednesday, May 30th, 1923,

for the reconstruction of the northerly 200 lineal feet of the slip wall at Whitby, County of Ontario, Ontario.

Plans and forms of contract can be seen and specification and forms of tender obtained at this Department, at the offices of the District Engineers, Equity Building, Toronto, Ont.; Royal Bank Building, London, Ont., and at the Post Office, Whitby, Ont.

Tenders will not be considered unless made on printed forms supplied by the Department and in accordance with conditions contained therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works equal to 10 per cent. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

Note.—Blue prints can be obtained at this Department by depositing an accepted bank cheque for the sum of $10.00 payable to the order of the Minister of Public Works, which will be returned if the intending bidder submit a regular bid.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
19 Ottawa, May 7, 1923.

Equipment for Sale

Complete equipment for rock quarrying and macadam road construction. Apply Box No. 217, Contract Record, Toronto. 15-T.f.

STEEL PILING

Bought and Sold

Universal Equipment Company

Niagara Falls. 11-T-f.

Town of Burlington

Sealed tenders plainly marked as to their contents will be received up to **Thursday, Four o'clock, P.M., May 17th, 1923**, for the construction of approximately,

21,000 square yards of Concrete Pavement

on Brant Street and approximately 14,000 square yards on other streets, also bids for approximately 14,000 square yards of Bituminous Penetration and 1,600 lineal feet of concrete curb, also approximately 1100 feet of Six feet by Ten feet reinforced concrete storm sewer.

Plans and specifications can be seen and forms of tender obtained at the office of the Town Clerk or the Town Engineers.

The lowest or any tender will not necessarily be accepted.

MACKAY & MACKAY,
Town Engineer,
Hamilton, Ont.
L. SYKES,, Clerk,
Town of Burlington,
Burlington, Ont.

19

FOR SALE

5" Cooke Transit in first class condition. Price $125.00. Box No. 251, Contract Record, Toronto. 19

WANTED

6 Dump Carts for concrete paving. Box No. 250, Contract Record, Toronto. 19

Concrete Mixer for Sale

One Concrete Mixer, ½ yard capacity, loading hopper, steam power, made by London Concrete Machinery Company. Good condition, $900.00 Price new over $2,200.00.

THE LABERGE LUMBER CO. LTD.,
19-21 Sudbury, Ont.

For Sale

Contractors equipment for sale. Low prices for quick sale. Practically new yard concrete mixers; hoisting engine, hoppers, buckets, chutes, blocks and tackle; 2 x 4 and 4 x 4 lumber, many other small tools, etc.

THE Wm. F. SPARLING COMPANY,
19 54 University Ave., Toronto.

Some One Wants to Buy

The equipment or machinery that you are not using.

It may be occupying valuable space in your yard or shop, collecting dust, rust and hard knocks.

Sell it before "Depreciation" scraps it.

Use the Tender & For Sale Department. It helps others, let it help you.

FOR SALE

Fire Proof Vault Doors

We have for immediate delivery 49 vault doors, clear opening 36" x 78" built special for 17" wall, instead of 20" wall which is our standard. We will dispose of all or part of these doors at a very reasonable price in order to sell them at once.

DOMINION SAFE & VAULT CO. LTD.,
18-20 Niagara Falls, Ont.

To Rent

Steam Road Roller, First Class Shape. The T. Sidney Kirby Co. Limited, 213 Sussex St., Ottawa. 16-T.f.

FOR SALE

Electric Travelling Cranes and Steel Crane Runways

STEEL CRANE RUNWAY—382 ft. long; height of columns 30 ft..: weight about 150 tons. Used for 15-ton Crane 80 ft. span.

STEEL CRANE RUNWAY—220 ft. long; height of columns 23 ft. Also 22 additional Girders each 20 ft., without columns, sufficient to extend Runway 220 feet additional. Total weight about 50 tons. Used for 10-ton Crane 70 ft. span.

These runways can of course be used for any width of crane desired. Can furnish blueprints showing construction.

Ask for prices and further particulars, also a complete list of our second hand machinery.

The Maritime Bridge Co., Ltd.

NEW GLASGOW, N.S. 19

For Sale

New and Second Hand Rock Crushers, Steam and Gasoline Rollers, Portable Steam Engines, Dump Wagons, Etc.

Also

Repairs for Crushers, etc.

J. B. DORE & FILS,
18-21 Laprairie, P. Que.

WANTED

Exclusive representatives resident in Toronto; Hamilton; Windsor; Fort William; Sudbury; Halifax; Sydney; St. John, N.B.; Quebec; Three Rivers, for well-known Waterproofing System. Must have connection with Architects, Engineers, Contractors, Pulp and Paper and Industrial plants and show good record. To such a very attractive contract will be given. Box 254, Contract Retract Record, Toronto. 19

ESTIMATOR—Open for engagement; Scotch trained; twenty years experience. Box 245 Contract Record, Toronto. 18-21

SUPERINTENDENT of construction completing half a million job open for position by 1st of June. Best references. Go anywhere. Box 253, Contract Record, Toronto. 19-21

CONTRACTOR'S SUPERINTENDENT, just disengaged, requires position, life-long experience, well up in all classes construction, quantities and estimating, excellent references. Box 224, Contract Record, Toronto. 19

GENERAL CONSTRUCTION SUPERINTENDENT wants job. Thoroughly practical with twenty years experience. Last job Quarter of a Million. A1 references. Go anywhere. Box 231, Contract Record, Toronto. 17-20

[illegible]

[illegible], Que.

[illegible]

Schomberg, Ont.

[illegible]

South Vancouver, B. C.

[illegible]

[illegible]lle, Ont.

[illegible] tric Power Commission and [illegible]

Sutton, Ont.

[illegible] $29,000 to build a Hydro-electric extension to the village was carried. A sub-station will be built two miles south of [illegible]

Timmins, Ont.

Newspaper reports state that the rights to develop 25,000 horsepower at Long Sault has been granted to the [illegible]

We Issue Surety Bonds

for Contractors, for Public Highways, Contracts and all Municipal and private Corporation work.

We keep up to date information on contracts let and tenders called.

Try our service.
Phone Main 3476

[illegible] Representatives

Fidelity Insurance Co.
of Canada

[illegible]

Winnipeg, Man.

The City is receiving tenders until May 14 for electrical supplies including a quantity of steel for transmission line towers, f.o.b. Beausejour and Milner. C. J. Brown, City Clerk.

Woodstock, Ont.

A by-law, authorizing the raising of $20,000 for extensions to the electric light and power service, was passed by the City Council.

Miscellaneous

Longueuil, Que.

The Thomas Wand Housing Co., Longueuil, has been incorporated with a capital of $20,000 to carry on business as builders.

Montreal, Que.

Private tenders for a plant for the National Cement Co., 90 St. James St., are being received by Louis Hurtubise, Room 300, 90 St. James St.

Rigaud, Que.

Prices on cast iron pipes of various sizes, for culverts, are invited by the Town Council. N. Brule, secretary.

Toronto, Ont.

The Canadian Ulen Co. Ltd., head office, Toronto, capital, $50,000, has been incorporated to carry on business as engineers and general contractors.

Tenders for the construction of a concrete retaining wall around the site of the Roncesvalles car-house, including all excavating, concrete work, steel work, etc., necessary for the completion of the wall, will be received by the Toronto Transportation Commission until May 21.

West St. John, N. B.

Tenders for steel stairs and electric wiring for the City Hall, are being received by the Commissioner of Public Safety, John Thornton. G. G. Hare, engineer, has plans and specifications.

Late News

Ailsa Craig, Ont.

Disastrous fire swept the town early this week, causing a loss of $100,000, according to newspaper reports.

Burlington, Ont.

Tenders for the construction of 35,000 sq. yards of concrete pavement, 14,000 sq. yards bituminous penetration, 1,600 lineal ft. of concrete curb and 1,100 ft. of 6 x 10 ft. reinforced concrete storm sewers will be received by the Town of Burlington up to 4 o'clock, May 17th.

Islington, Ont.

The general contract for building a bridge over the Etobicoke Creek, at Queen St., Islington, was awarded by the Township Council to the Highland Construction Co., at $26,853. For the construction of a bridge in the northern section of the Township Ritchie Construction Co., was awarded the contract at $8,172 while the Standard Construction Co. was awarded the contracts for grading and filling at both bridges.

Plans are being prepared for the Township Council for the erection of a 100 ft. standpipe at Islington.

Kitchener, Ont.

Tenders will be called about June 7 for the Sisters of Joseph Hospital, costing $440,000. Watt & Blackwell, Bank of Toronto Bldg., London, architects.

Montreal, Que.

The City will call for tenders shortly for asphalt paving for Rosemount Blvd. S. Fortin, engineer.

Ottawa, Ont.

Tenders for the construction of piers at Whitby, Ont., will be received by the Department of Public Works, Ottawa, until 12 o'clock noon, Wednesday, May 30th. Plans, form of contract and specifications at the office of the District Engineer, Equity Bldg., Toronto; Royal Bank Bldg., London; Post Office, Whitby.

Prince Rupert, B. C.

A despatch from Prince Rupert states that a large cannery at Port Essington, owned by H. Bell-Irving, Vancouver, was destroyed by fire at a loss of $100,000.

Shawinigan Falls, Que.

City Manager, J. H. Valiquette, is in the market for 5,500 feet of extra heavy 12 inch cast iron pipe.

Smith's Falls, Ont.

Ratepayers passed a by-law this week authorizing the purchase of a water power plant. The Water Commission will utilize the water power in connection with the waterworks system.

Todmorden, Ont.

Ratepayers have decided to circulate a petition requesting the York Township Council to instal a sewerage system.

Toronto, Ont.

Tenders for No. 42 - 42 inch and 36

WE WILL BOND YOU

Our bond is evidence that the contractor is thoroughly reliable and dependable as a contractor, and that he has the financial ability to back up his reputation.

Resources over - - - $31,790,000
Canadian Securities - $ 2,247,500

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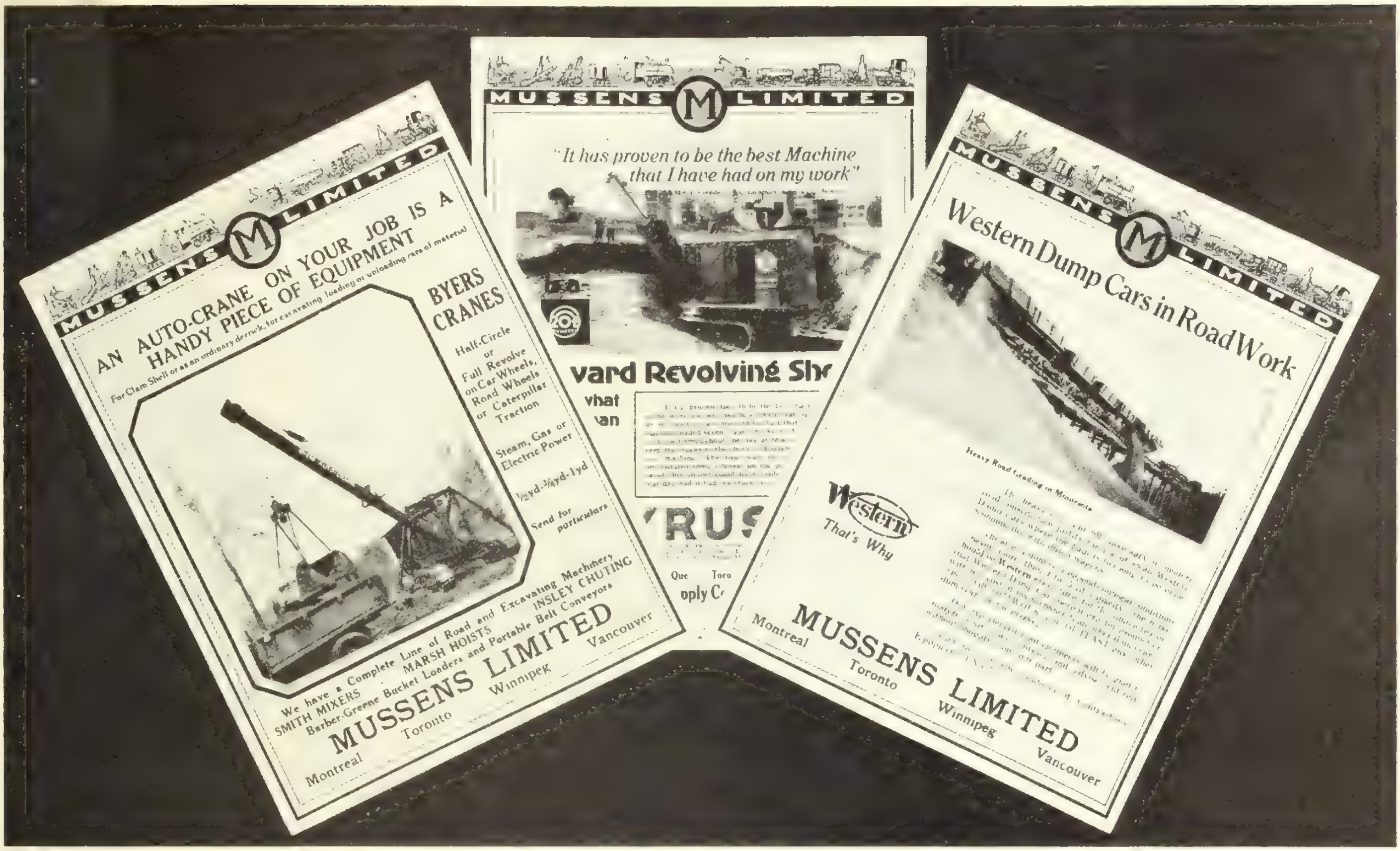
Assistant General Manager

112 St James St.
MONTREAL

W. R. Kirkpatrick
Canadian Secretary

UNITED STATES FIDELITY & GUARANTY COMPANY



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AN AUTO-CRANE ON YOUR JOB IS A HANDY PIECE OF EQUIPMENT

For Clam Shell or as an ordinary derrick, for excavating, loading or unloading cars of material

BYERS CRANES

Half-Circle or Full Revolve on Car Wheels, Road Wheels or Caterpillar Traction

Steam, Gas or Electric Power

½yd-¾yd-1yd

Send for particulars

We have a Complete Line of Road and Excavating Machinery
SMITH MIXERS MARSH HOISTS INSLEY CHUTING
Barber-Greene Bucket Loaders and Portable Belt Conveyors

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

MUSSENS LIMITED

"It has proven to be the best Machine that I have had on my work"

vard Revolving Sh

MUSSENS LIMITED

Western Dump Cars in Road Work

Heavy Road Grading in Minnesota

Western That's Why

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

What Do Mussens Limited Think of Contract Record?

Well we haven't asked them, and they haven't said in so many words.

But this is what they have **done.** They have recently signed a contract for three pages in color in every issue of this paper for a year.

That, perhaps, more eloquently than any testimonial they could write, expresses their opinion of the value of advertising in Canada's leading publication in the construction and engineering fields.

If Mussens were a young firm or a new advertiser this decision of theirs might not have so much significance. The fact is, however, that for many years a full page advertisement for this firm has been appearing in every issue of "CONTRACT RECORD", and this increase of 300 per cent in the volume of their advertising in this one paper has been made after the most exacting test of the value of the publication.

Experience has evidently taught them that the buyers of heavy equipment in Canada read and are influenced by the advertisements which appear in "CONTRACT RECORD".

We believe it is also evidence of another important fact. It indicates Mussens' conviction that the year 1923 gives promise of increased activity in construction projects. They evidently believe that this is going to be a "buying" year.

If this is true, will it not pay other distributors and other manufacturers to use impressive space in the advertising pages of "CONTRACT RECORD"?

What Tenants Seek

The installation of a Sturtevant heating and ventilating system is a big step toward meeting the most exacting of requirements. For pure air, circulated throughout well heated buildings, is what tenants of every type seek.

The experience of Sturtevant engineers is at your disposal, no matter what your needs.

Write to day, too, for folder 606.

B. F. Sturtevant Company
of Canada, Limited
Montreal - Galt - Toronto

Sturtevant
PUTS AIR TO WORK

inch cast iron special castings, addressed to the Chairman of the Board of Control, will be received by the City until May 22.

Huge Tunnel Completed

The new hydraulic pressure tunnel of the Niagara Falls Power Company, Niagara Falls, N. Y., Completed at a cost of $2,500,000, was thrown open for public inspection recently. The great tube, which is 4,000 feet long and has a diameter of 32 feet within its two-foot concrete walls, runs from an intake on the banks of the lower gorge.

The tunnel will carry a volume of water sufficient to feed three huge slope tunnel penstocks and operate three Hydro-electric power units, each of 70,000 horsepower capacity, in the power house below the gorge bank. Construstion was started April 25, 1921, under a license given the company by the Federal Power commission to divert 19,500 cubic feet of water from the Niagara river for the development of power.

Water will be turned into the tube within a few weeks.

Railway Shops Established

The locomotive and railway rolling-stock construction and repair shops located near Marseille in 1919 by the Chantiers et Ateliers de la Capillette comprise the most important industry established in the south of France since the war.

The plant covers about 32 acres and has, in addition to a large diversity of factory buildings and sheds, about 12 kilometers of railway line. The shops are equipped to repair 400 railway carriages at a time, and one building, 170 by 75 meters, is able to handle 36 locomotives simultaneously. A large number of electric traveling cranes, some having a capacity of 60 tons, are in use; the entire equipment is said to be complete and modern in every way. Much of the repair work of the Paris-Lyon-Mediterranee Railway and of the Midi Railway system, as well as that of the smaller local lines, is handled by this plant.

New Theatre Planned

The closing of shanley's Resturant at Times square and West 43 Street, N. Y., when a voluntary petition in bankruptcy was filed by the proprietor, only anticipated the expiration of the Shanley lease in the building in which it was located by about sixty days. Now that the restaurant is a thing of the past, the structure that housed it will soon be demolished and replaced by a twenty storey office and theatre building estimated to cost about $9,500,000.

Plans of the new structure, which is to be built by a corporation, of which Adolph Zukor is president, are nearing completion, and it is expected they will be announced within a few weeks. The new building will occupy the block front with the west side of Broadway from Forty-third to Forty-fourth streets, and 207 feet on Forty-third and Forty-fourth streets.

The theatre, which will have a seating capacity of about 4,000 it is said, will be one of the finest in the city.

BURLINGTON STEEL COMPANY, LIMITED

HAMILTON CANADA

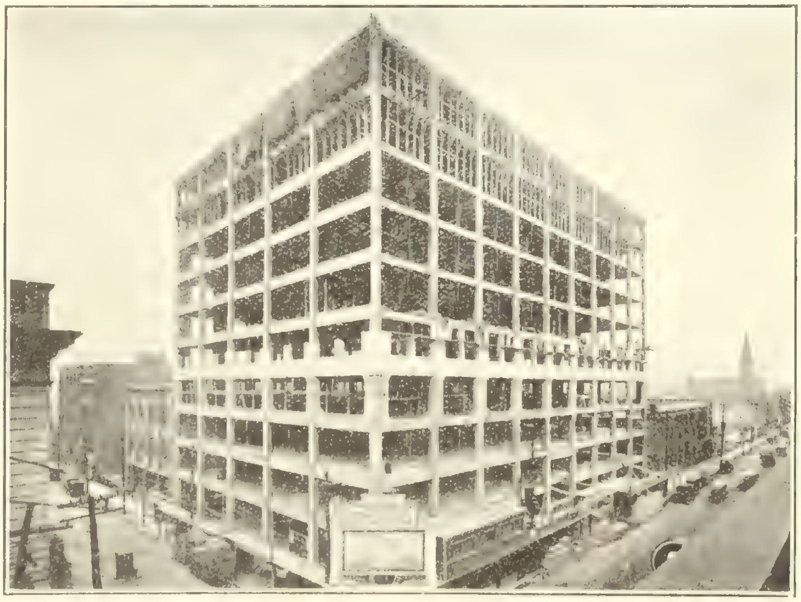
Modern Concrete Reinforcement

While Rail Steel Bars conforming to "American Society for Testing Materials Standard Specifications A-16-14" for Concrete Reinforcement have been available in Canada only for a few years, they are being specified by many architects and engineers.

We believe, however, that the use of this material would be greatly extended were the facts concerning these bars more generally known. In quality, in strength, and in all other characteristics that make for a good reinforcing bar, Rail Steel Bars are not only equal but superior to all other grades of steel manufactured for this purpose.

You, as an architect, engineer, contractor or user of reinforcing bars in any form, are entitled to some valuable information about Rail Steel Bars which has not heretofore been published. Facts relating to the manufacture, qualities and use of these bars have been published in a volume entitled "Rail Steel for Concrete Reinforcing" a copy of which we will gladly send you upon request.

You'll be interested in the facts contained in this book. A copy is yours for the asking.

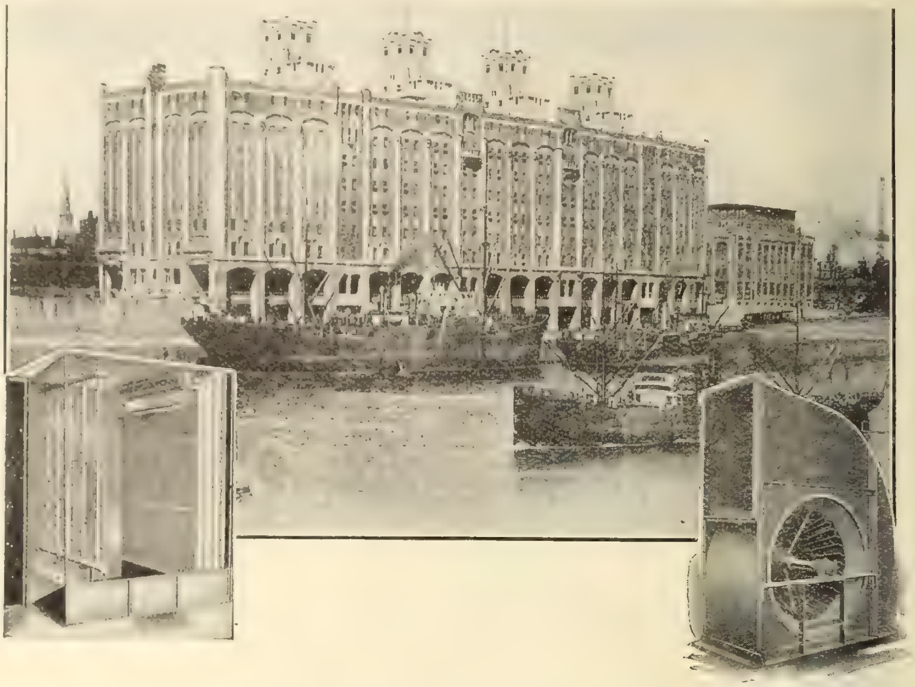


Burlington Reinforcing Bars used in construction of new Federal Office Building, Toronto, erected 1922.

YOLLES & ROTENBURG, LTD.
Owners

CANADIAN CONCRETE STEEL CO.
Engineers.

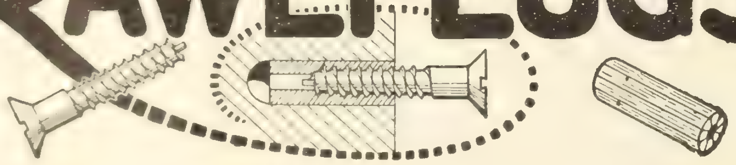
Largest
Cold Storage
Warehouse
in America has
Air and Brine
Circulated by
Our Fans, Pumps
and Carrier
Air Washers



Fumes from material that previously occupied storage space are kept from contaminating next material stowed. Send for catalog covering equipment. Write to Department No. 12.

Canadian Blower & Forge Company, Ltd. **Kitchener, Ont.**
Toronto Montreal Calgary Vancouver St. John Winnipeg

RAWLPLUGS

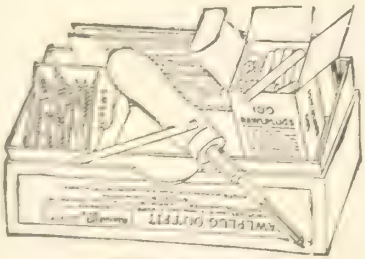


Save Time on Every Screw Used

"FIX IT WITH RAWLPLUGS"

Thousands of builders and contractors throughout Canada are using them on all their jobs. They save time and labor, and do better work when Rawlplugs are used. Rawlplugs are best for all materials, they never loosen—never slip. No other device offers the same advantages. Rawlplugs are cheaper to buy, cheaper to use and eliminate a bagful of cumbersome tools.

Order our mechanic's outfit today, and try them out for yourself. You'll soon see the saving they effect.



Mechanics' Outfit

INVENTIONS LIMITED
Sole Agents for
THE RAWLPLUG CO., OF CANADA
Southam Bldg., Bleury St., MONTREAL
Sales Agents:
Dominion Engineering Agency, Ltd., 24 Adelaide St. E, Toronto
Sterling Specialties, 213 Somerset Building, Winnipeg, Man.
H. G. Evans, 58 Water St., St. John, N.B.
Blackadar & Stevens, 139 Roy Bldg., Halifax, N.S.
Agents wanted in Ottawa and Vancouver

Here's Real News

The Hydro Electric Power Commissioners of Ontario
have appointed a Sales Syndicate
to advantageously liquidate all the

Equipment and Supplies

which can be released from the

Queenston-Chippawa Development

The majority of this Equipment—recently released—was purchased new and used only on the above undertaking. This is a splendid opportunity to secure really high grade, modern Machinery-Accessories and Supplies at prices that are right.

Our amended Stock List is now being prepared and we will be very glad to forward your copy, upon request. Time spent consulting this list will be time well spent. Someone will profit handsomely as those who purchase any of this "special offering" which is available are going to make one of the best purchases in their career.

We give below a general idea of what class of equipment is available.

Steam and Electric Shovels—Steam and Electric Locomotives—Air Dump Cars—Air Compressors—Channellers—Conveyors—Drills—Motors—Concrete Mixers—Concrete Cars and Auxiliary Equipment—Electric and Steam Hoists. In fact—almost everything you might require.

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Our Representatives
will give every service

Put your name on our mailing list at once for complete "Sales Inventory"

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and

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When placing your order for

HYDRANTS, VALVES and VALVE BOXES

place it with us.

MADE IN CANADA

Strong, Substantial and
Modern Designs.
Prices right.
Write for prices and see.

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VALVE AND HYDRANT MANUFACTURERS
WALKERVILLE, ONT.

BOOKS

for Engineers and Contractors

The following Books are Offered subject to Previous Sale.

"Elasticity and Strength of Materials Used in Engineering Construction,"—Section 1, by C. A. P. Turner, C. E. Minneapolis. Just published. Price $5.00.

"Hand Book of Hydraulics," by Horace Williams King. 1st edition published by McGraw-Hill Book Co., Inc. 424 pages. Price $3.50.

"Handbook of Building Construction," by George A. Hool and Nathan C. Johnson. Two volumes, (not sold separately,) 1474 pages, illustrated. Published in 1920 by McGraw-Hill Book Co., Inc. Price $12.00.

"Operation and Maintenance of Irrigation Systems," by S. T. Harding. First edition, published in 1917 by the McGraw-Hill Book Co., Inc. 271 pages, illustrated. Price $2.50.

"Practical Road Building," by Charles E. Foote. Just published by David McKay, 295 pages, illustrated. Price $1.50.

"Relief from Floods." The Fundamentals of Flood Prevention, Flood Protection and the means of determining proper remedies. By John W. Alvord and Charles B. Burdock. First edition published in 1918 by McGraw-Hill Book Co., Inc. 175 pages, illustrated. Price $2.00.

"Sheet-Metal Pattern Drafting and Shop Problems," by James S. Daugherty. Published in 1922 by The Manual Arts Press, 173 pages, illustrated. Price $2.50.

"Steel Bridge Designing," by Melville B. Wells, C.E. Published by Myron C. Clark Publishing Company in 1913. 260 pages, illustrated. Price $2.00.

"The Engineering Index for 1920," recently published by the American Society of Mechanical Engineers, 586 pages, price $6.00.

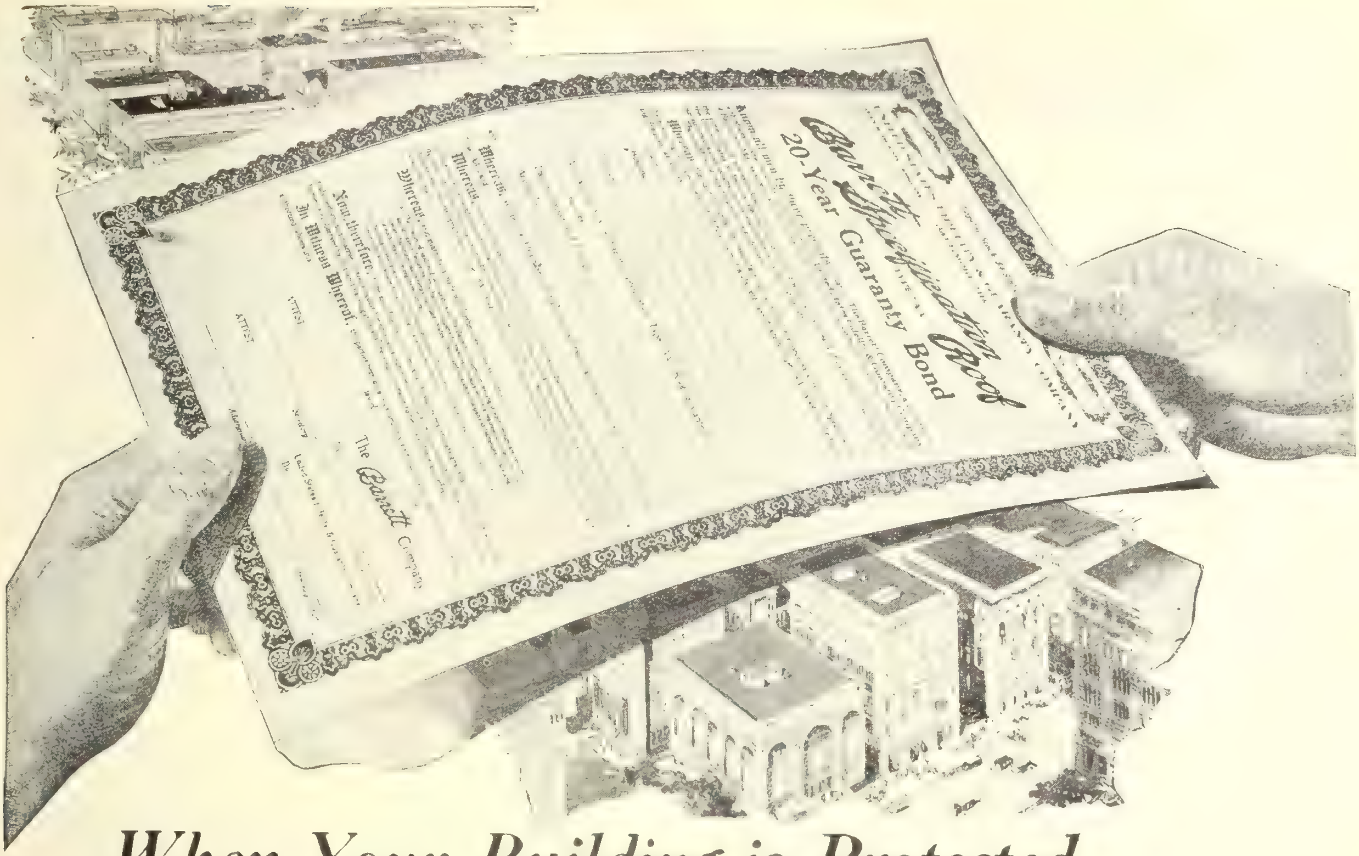
"Use of Water in Irrigation," by Samuel Fortier. Published in 1915 by McGraw-Hill Book Company. 265 pages, illustrated. Price $2.00.

"Use of Water in Irrigation," by Samuel Fortier. Second edition. Published by McGraw-Hill Book Company, 1916. 325 pages, illustrated. Price $2.50.

"Water Purification," by Joseph Ellms. Published in 1917 by McGraw-Hill Book Company. 485 pages, illustrated. Price $5.00.

"Collected Papers On Acoustics," by Wallace Clement Sabine just published by the Harvard University Press. Price $4.00. 280 pages, illustrated.

Contract Record
347 Adelaide St. West, Toronto, Ont.



Barrett Specification Roof
20-Year Guaranty Bond

The Barrett Company

When Your Building is Protected by This 20-Year Bond—

YOU are not only insured against roof repair expense but safeguarded against all roof troubles. For the Surety Company Bond that guarantees the Barrett Specification Bonded Roof means much more than appears on its face.

It means that the roof was laid by a roofing contractor who has earned a reputation for skillful, dependable work. For only such roofers can obtain the Surety Bond Guarantee for the owner.

It means that a Barrett Inspector was present on the job to see that the high grade pitch and felt called for by the Barrett Specification were properly applied to give maximum strength and durability—present to make the famous *cut test* which insures that all details of the Specification have been carried out —present to see that the heavy top coat of Specification Pitch was *poured* and the gravel or slag surface properly imbedded to insure as high a degree of fire protection as any roof can possibly provide.

When your roof is built by a reliable roofer, and is laid strictly according to The Barrett Specification, you are assured of freedom from roof troubles even far beyond the bonded period.

Barrett Specification Bonded Roofs cost less *per year of service* than any other kind of flat roofs.

There are two types of Barrett Specification Bonded Roofs—Type "AA," bonded for 20 years, and Type "A," bonded for 10 years. Both are built of the same high-grade materials, the only difference being in the quantity used.

Copies of the Barrett Specification sent free on request.

The Barrett Company
LIMITED
MONTREAL TORONTO ST. JOHN, N. B.
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Barrett Specification Roofs

Bonded for 20 and 10 Years

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No job too big, or too small for us.
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Shingles	All-Steel Doors
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Hammond Place HILLCREST 4843
Branch
90 Lincoln Rd., WALKERVILLE, ONT.

For Reliable Representative Canadian Contractors Consult this Section of the Contract Record

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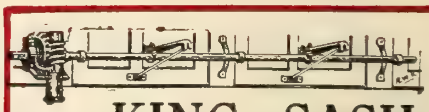

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for all types of buildings
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For all classes

Heavy and Continuous Service

Machine Shops, Warehouses, Bridges, Breweries, Railroad Stations, Schools, etc. Our special waterproofing specifications have been used for years by Architects and Engineers.

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H. H. SYMMES & CO., LTD.

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CANADIAN RED QUARRIES
and tiles for walls, entrances and hearths.
Briquettes, Metal Lath, Dome Dampers,
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Sani-Onyx Restaurant Equipment

GENERAL PRODUCTS, Limited

Contractors—Agents—Jobbers

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Stone and Sand Supplied

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Recent Contracts:

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Good Safe Reliable

THE BENNETT & WRIGHT CO.
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Marble Dust Marble Chips

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Marbles, Slates, Terrazzo, Tiles, Mosaics, Ceramics, Onyx, Decorative Marble Works, Marble Memorial Tablets, Altars, Fonts and Mantels a Specialty.

145 Van Horne Ave. Montreal, Can.
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Building Tile
Field and Drain Tile

Famous Denison load bearing everlasting Tile at money saving prices any season of the year.

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Quick Shipments

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Large assortment of stock sizes on hand
Send for catalogue

Pannill Door Co.
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All Artificial Stones for interior and exterior Architectural Sculptors
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Large Variety of Stock Patterns on hand. Special Models made to Detail.

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Wall and Floor Tiles of all Kinds

Catalogs and Prices on application

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ENGINEERS & CONTRACTORS

Masonry & Steel Proofed against Water, Oils and Acids under GUARANTEE

13 KING WEST, TORONTO
Phone Adel. 6310

St. Louis
Detroit
Cleveland

New York
Boston
Philadelphia

Current Prices of Building and Engineering Materials

		Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.35
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	11.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	30.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*†	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to	230.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		50.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 “	“ “
Crusher run	per ton	2.20½		3.00 “	“ “
Rubble stone	per ton	2.45	1.70	15.00 cord	“ “
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	“ “
Gravel 1 in. screened	per ton	2.31	1.50	2.75 “	“ “
Sand, screened	per ton	1.42½	1.25	1.90 “	“ “
Pit run	per ton	1.52¾	1.25	1.90 “	“ “
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.75 base	3.75 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.25 “	3.75 “	5.10 base	
Hoops	per 100 lbs.	5.00 “	4.75 “		
Twisted and deformed bars	per 100 lbs.	3.75 “	3.75 “	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	3.90 “	3.75 “	5.35	6.00
Structural shapes	per 100 lbs.	4.00 “	4.00 “	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.50 “	3.75 “	5.15	6.25
Plates—3/16 in.	per 100 lbs.	4.00 “	4.10 “	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.40 “	4.50 “	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.50 “	5.10 “	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.90	7.00	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.65 “	7.00 “	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 “	6.00 “	7.00 base	
Cast iron pipe	per ton	65.00	60.00		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.28
Sewer pipe, 6 in	per ft.	.60	.45	.45	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

[illegible] *Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.

[illegible] *Discount of 5%. †Bag of 50 lbs **Price f.o.b. cars is $11.70.

[illegible]

STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.

This pipe covering saves more heat

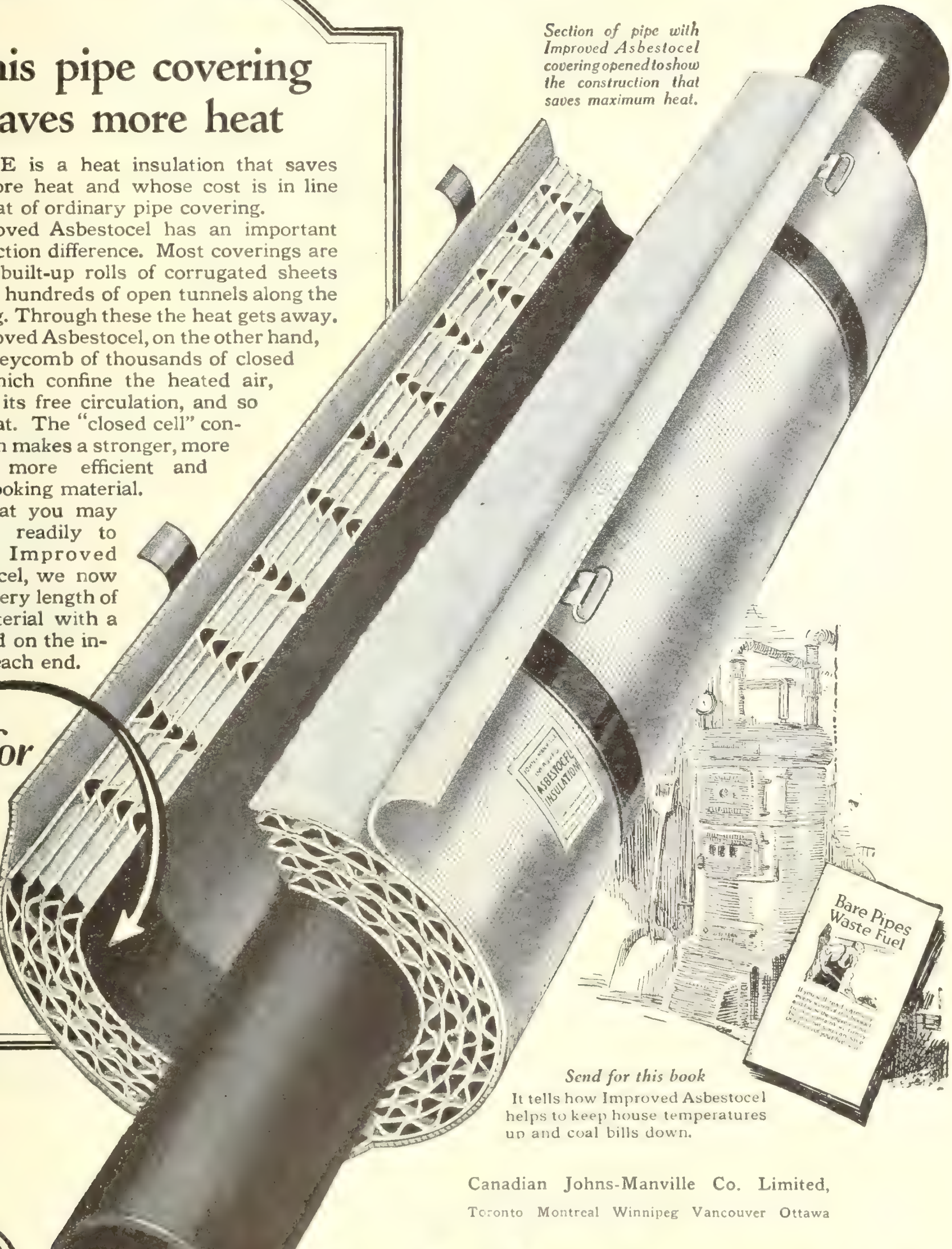
HERE is a heat insulation that saves more heat and whose cost is in line with that of ordinary pipe covering.

Improved Asbestocel has an important construction difference. Most coverings are merely built-up rolls of corrugated sheets forming hundreds of open tunnels along the covering. Through these the heat gets away.

Improved Asbestocel, on the other hand, is a honeycomb of thousands of closed cells which confine the heated air, prevent its free circulation, and so save heat. The "closed cell" construction makes a stronger, more lasting, more efficient and better looking material.

So that you may be able readily to identify Improved Asbestocel, we now mark every length of this material with a red band on the inside of each end.

Look for the red band



Section of pipe with Improved Asbestocel covering opened to show the construction that saves maximum heat.

Send for this book
It tells how Improved Asbestocel helps to keep house temperatures up and coal bills down.

Canadian Johns-Manville Co. Limited,
Toronto Montreal Winnipeg Vancouver Ottawa

Johns-Manville Service
Covers the Continent
Through—
Asbestos
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INSULATION
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JOHNS-MANVILLE
Improved Asbestocel

CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS—continued

		Toronto	Montreal	Winnipeg	Vancouver*
Lumber (Delivered on job):—					
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	94.50	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	30.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	30.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	per M.	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	42/45	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	50/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.50	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	14.55	14.60	15.60	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	5.95	4.25	5.50	9.25
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.28	1.40	1.26	1.28
Raw linseed oil, in bbls.	per gal.	1.25	1.38	1.23	1.25
Turpentine, in bbls.	per gal.	2.25	2.20	2.50	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	30.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.25	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers (Common)	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Laborers (Skilled)	per hr.	.60- 70			.90
Sheet Metal Workers	per hr.	.80			

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

PLASTER *Including bags.

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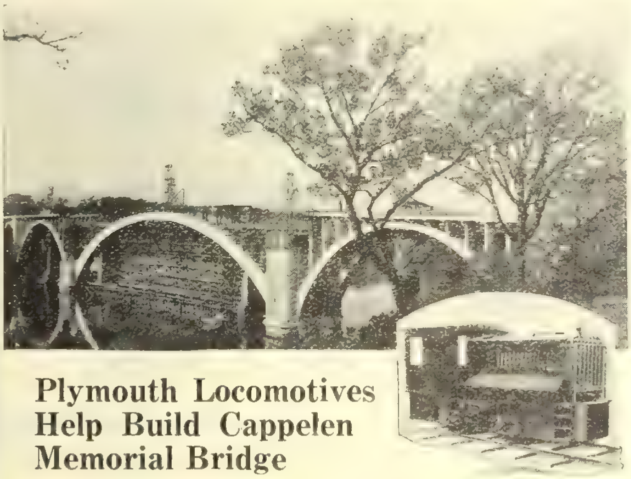

Plymouth Locomotives Help Build Cappelen Memorial Bridge

The Cappelen Memorial Bridge, Minneapolis, is over 1,000 feet in length. The main, or centre span, is 400 feet in length, and is the longest concrete arch ever constructed in bridge work in this country.
The bridge contains 32,000 yards of concrete, 900 tons of reinforced steel and 1,400 tons of fabricated.
City Engineer Elsberg states: "The use of PLYMOUTH Gasoline Locomotives in conjunction with the central mixing plant has worked out very efficiently and economically."

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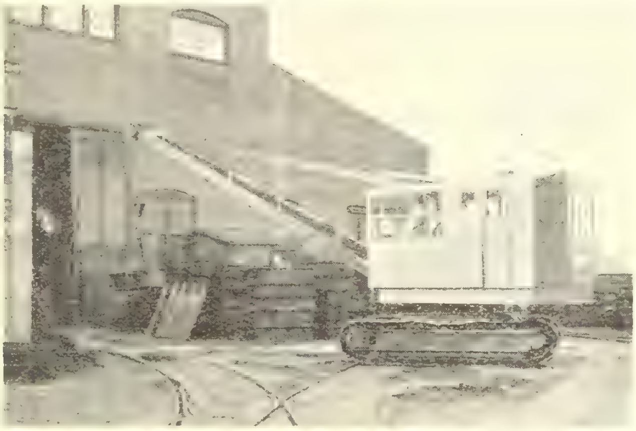
PLYMOUTH
Gasoline Locomotives



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Here we show you a Type "K" Iron Body Standard Gate Valve. Bronze Mounted. Inside Screw. Non-rising Spindle. Hub Ends. A valve approved by the Fire Underwriters and like all genuine Jenkins Valves bearing the Jenkins Diamond Mark.

This valve and Jenkins Indicator Posts are fully described in Catalog No. 9 which shows the complete Jenkins line. Free on request.

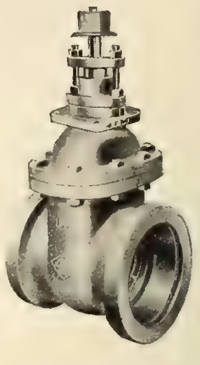

Fig. 400 F.M.

Regularly supplied to open by turning to the left. Can be furnished open right if desired.

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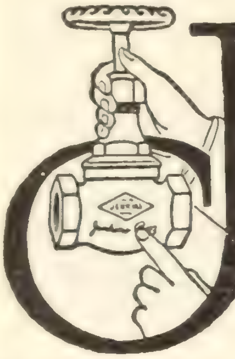

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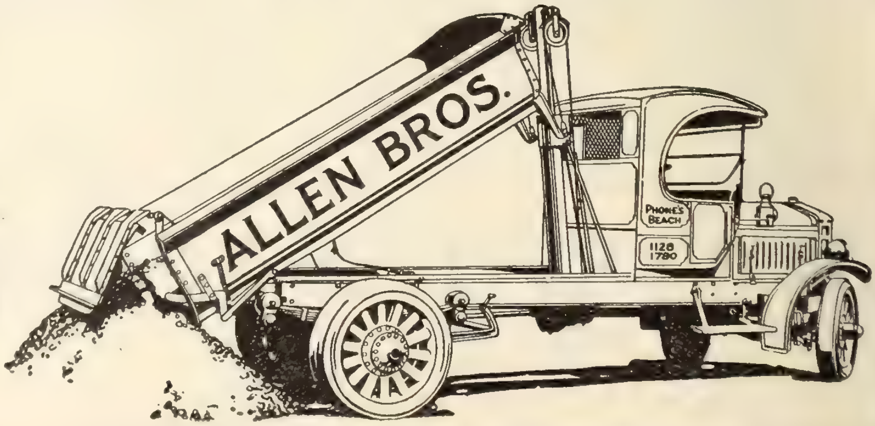

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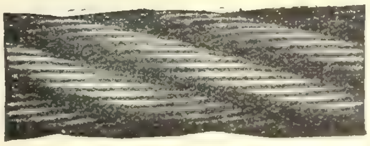

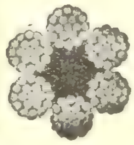

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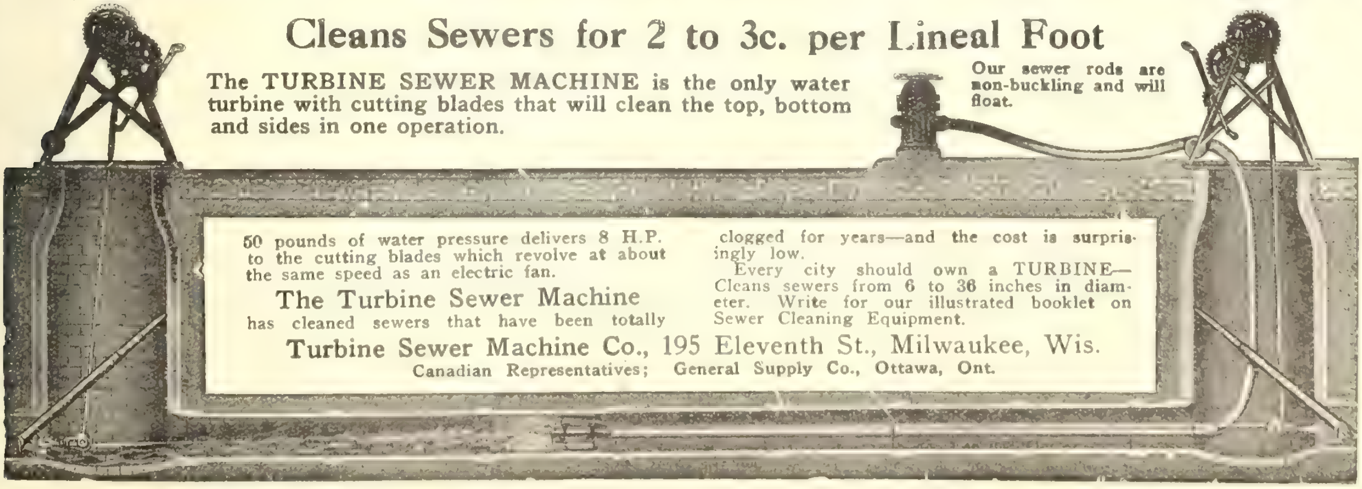

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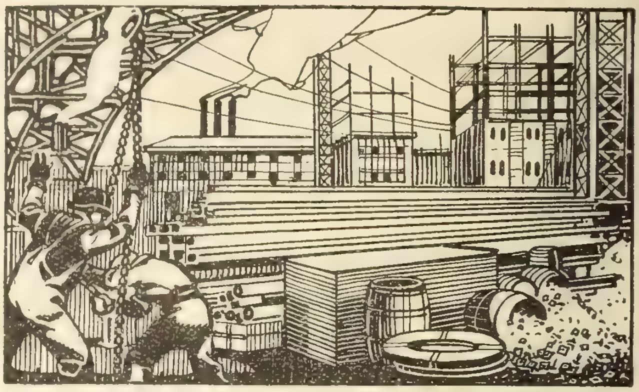

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Labor cost is cut, more material handled and the whole job speeded up.

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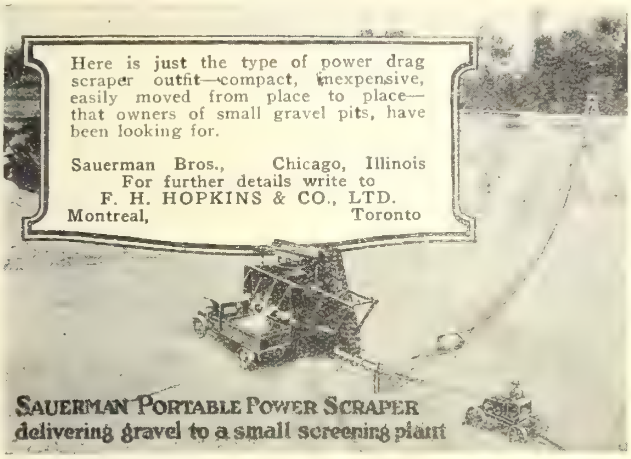

Here is just the type of power drag scraper outfit—compact, inexpensive, easily moved from place to place—that owners of small gravel pits, have been looking for.

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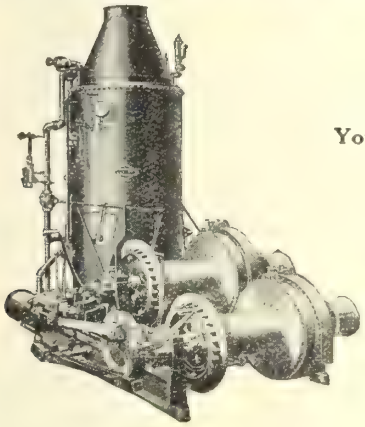

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Originally designed to meet the demands of logging operations, the Clyde Hoist is necessarily built to stand the severest tests and to make good on the unexpected overload.

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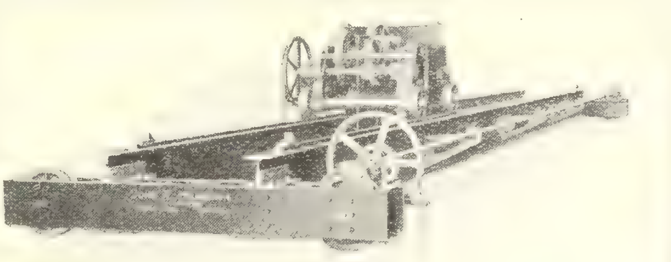

This Crane is an 8 Ton Hand Overhead with 45′ - 0″ Span. It is of the Double I Beam Type with built up Trolley to run on top. Where sufficient head-room is available this is the best type to adopt. The Rail Wheels are fitted with roller bearings to permit of easy travelling. All gearing is machine cut, giving the highest efficiency. If you are interested in a Crane, we stand ready to assist you.

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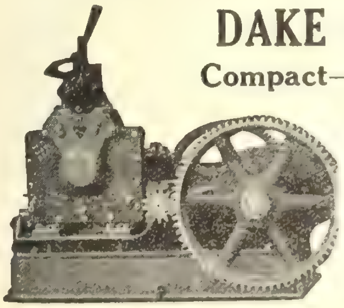

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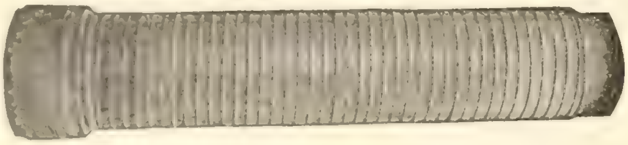

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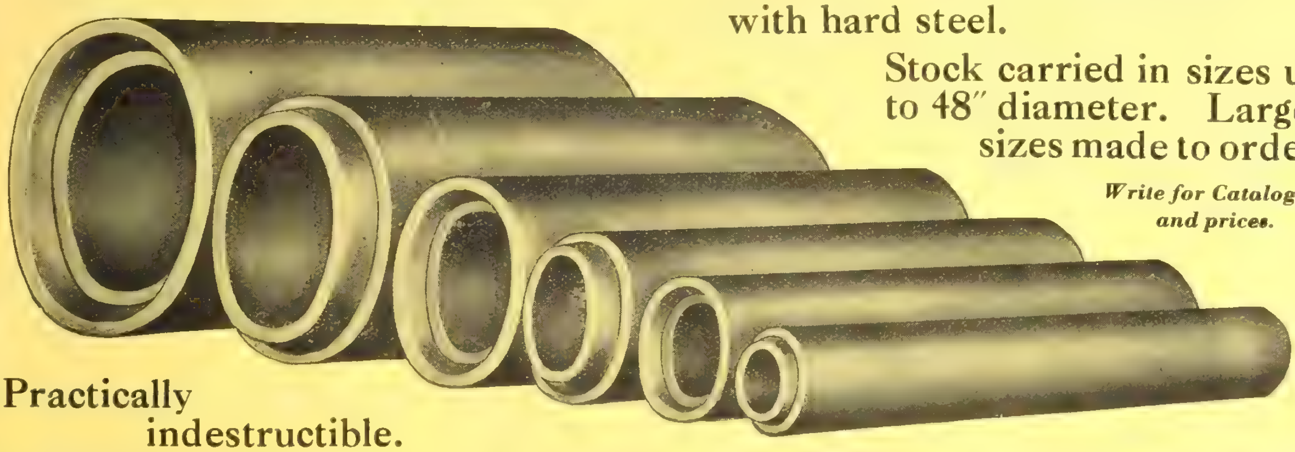

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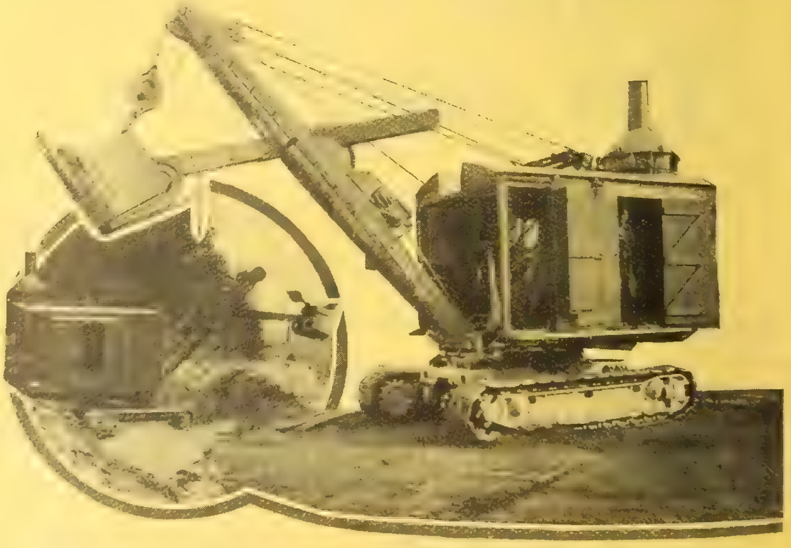

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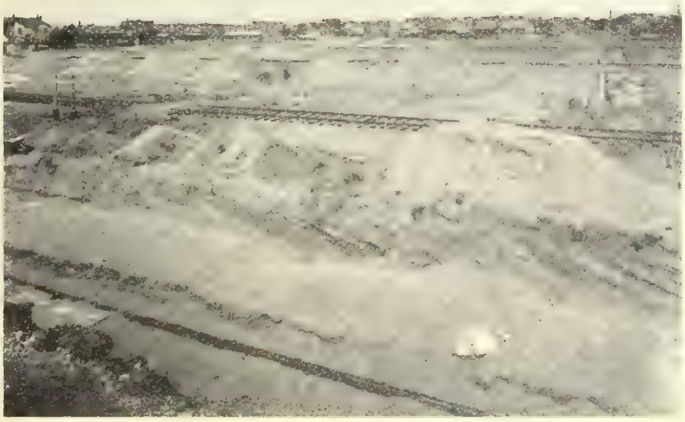

View showing foundation work for the Assembly Building in new plant of the Ford Motor Company of Canada Ltd., at Danforth Avenue, Toronto. Area covered over 4¼ acres.

View showing one of the many lines of Vitrified Clay Pipe Sewers in the same building

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HELTZEL
STEEL FORMS
BUILT LIKE A RAILROAD

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  - Otis Fensom Elevator Co.
  - [illegible]
- Enamelled Brick
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- Engines
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  - Canadian Ingersoll Rand Co.
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  - Fuller & Johnson Mfg. Co.
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- Fans, Propeller
  - Sturtevant, B. F. & Co.
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  - Northern Architectural Iron
- Fittings
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  - H. Mueller Mfg. Co., Limited
  - York Manufacturing Co.
- Fixing Devices
  - Inventions Limited
  - Rawplug Co., of Canada
- Flag Poles
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- Flooring Materials
  - Imperial Oil Company, Ltd.
  - National Fireproofing Co.
  - Vitrified Clay Pipe Publicity Bureau
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  - Canadian Blower & Forge Co.
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  - H. Mueller Mfg. Co., Limited
- Gantry and Cantilever Cranes
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  - Paris Sand & Gravel Co.
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  - Eaton & Sons, J. R.
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  - Canadian Link-Belt Co.
  - Clyde Iron Works Sales Co.
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- Hoisting Apparatus
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  - McAvity & Sons, T.
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  - Melville Quarry Co.
  - Muldoon, Ltd., J.
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  - Canadian Ingersoll Rand Co.
  - York Manufacturing Co.
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  - Canadian Link-Belt Co.
  - Erie Steam Shovel Co.
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  - General Products Co.
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- Meters
  - Builders Iron Foundry
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  - Philip Gies Foundry
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  - Lincoln Electric Co., of Canada Ltd.
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- Oil Tanks
  - Canadian Des Moines Steel Co.
  - Hamilton Bridge Works Co.
  - Hamilton Co., Wm.
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- Orange Peel Buckets
  - Orton & Steinbrenner Co.
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  - Dennis Wire & Iron Works Co.
- Ornamental Moulds
  - London Concrete Machry. Co.
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  - Barrett Company, Ltd.
  - Spielman Agencies Regd.
- Paints and Varnishes
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  - Spielman Agencies Regd.
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  - Dom. Tar & Chemical Co., Ltd.
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  - Dom. Tar & Chemical Co., Ltd.
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  - Standard Lime Co.
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  - Vancouver Wood Pipe & Tank Company
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  - Pacific Coast Pipe Co.
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  - Greening Wire Co., B.
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  - Clyde Iron Works
  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
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  - Canadian Pipe Co.
  - Dominion Concrete Company
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  - Hepburn, Ltd., John T.
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  - Hopkins & Co., Ltd., F. H.
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A Jenkins Standard Gate Valve for use with Indicator Post

Here we show you a Type "K" Iron Body Standard Gate Valve. Bronze Mounted. Inside Screw. Non-rising Spindle. Hub Ends. A valve approved by the Fire Underwriters and like all genuine Jenkins Valves bearing the Jenkins Diamond Mark.

This valve and Jenkins Indicator Posts are fully described in Catalog No. 9 which shows the complete Jenkins line. Free on request.

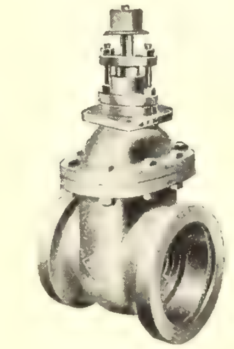

Fig. 400 F.M.

Regularly supplied to open by turning to the left. Can be furnished open right if desired.

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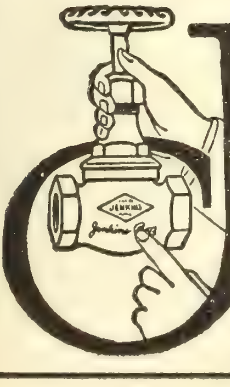

Always marked with the "Diamond"

Jenkins Valves

SINCE 1864

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Hopkins & Co., Ltd., F. H.

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Burlington Steel Company
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Greening Wire Co., B.

Reinforcement Ties
[illegible] Valve Bag Co.

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York Manufacturing Co.

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Imperial Oil Company, Ltd.

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Dom. Tar & Chemical Co., Ltd.

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Roofing Cement
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Ormsby Company, A. B.

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[illegible] Engineering & Construction Co.
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[illegible] Limited

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MacKinnon Steel Company
McGregor & McIntyre
Standard Steel Construction Co
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Sarnia Bridge Company
Standard Steel Construction Co.

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Clyde Iron Works
Dake Engine Co.

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Hamilton Bridge Works Co.
Inglis Co., John
McGregor & McIntyre
Waterous Engine Co.

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Tile Hollow
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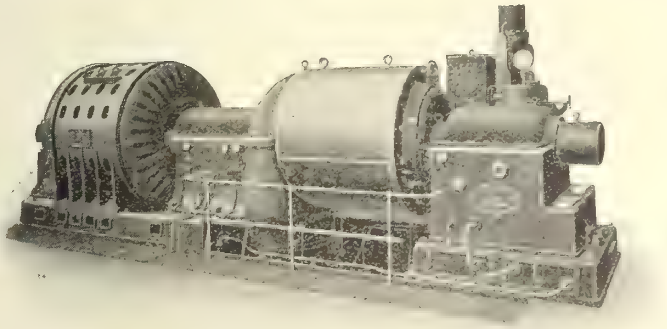
We carry a large stock of Structural Shapes and plates and can make prompt shipment on orders for plain material.



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STEAM TURBINES
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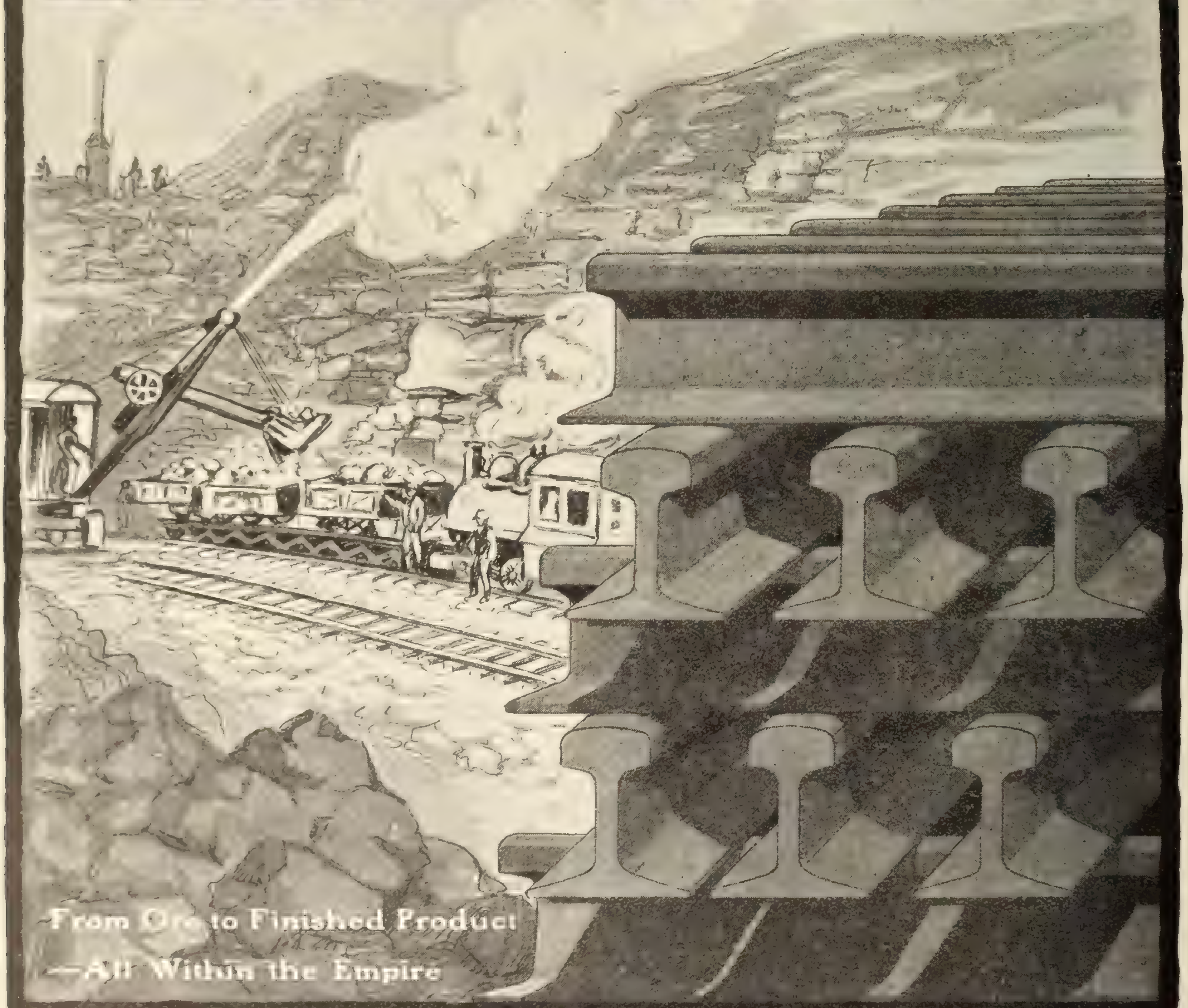
From Ore to Finished Product
—All Within the Empire

Light Rails for Mines, Construction Operations
and General Contractors' Use
(from 12 to 45 pounds per yard)

BRITISH EMPIRE STEEL
CORPORATION LIMITED
CANADA CEMENT BUILDING MONTREAL, CANADA

Western Representatives, Bissett & Webb, Limited Winnipeg

Your Business Winner!

The Date of the Big

Annual Number

of the

Contract Record and Engineering Review

ESTABLISHED 1886

If you have something to supply the builder, the contractor or the municipality, this issue represents your opportunity to be in the front row to secure your share of the big business about to be placed. The editorial contents of the Annual Number of the Contract Record will be of vital importance to the great majority of those who control the purchase of equipment and supplies this year. It will be their buying reference.

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Canada's Building Program for 1923

will be the biggest in history. $50,000,000 is to be spent on road improvements alone, with many millions more on immense industrial power developments, public works, etc.

CANADA CEMENT
CONCRETE
FOR PERMANENCE

View of Concrete Pavement, St. Boniface, Man., showing Concrete curing in foreground.

St. Boniface Extends Its Yardage of Concrete Pavement

Daily slump tests were made.

A particularly fine example of concrete paving is the 13,000 yards recently laid on Victoria St., St. Boniface, Manitoba. Concrete in the proportion of 1 to 4 mixed aggregate was used.

Slump tests were made to check up the consistency of the concrete. Test specimens were made from the concrete used in the slump tests. Results at 28 days showed a desirable uniformity in strength.

Curing of the surface was provided by covering the concrete with earth and sprinkling with a hose for ten days. The curb and gutter were made monolithic to prevent curling, and expansion joints were armoured and placed every 25 feet. Traffic was allowed on the pavement after 21 days.

Concrete, with its serviceability and low maintenance cost, is the basis of real road economy. It affords a hard, even, long wearing, traffic surface with just sufficient grit to prevent slipping of horses and skidding of vehicles.

We maintain a comprehensive library on all matters pertaining to Concrete and its uses. It is at your disposal. Write our Service Department.

Canada Cement Company Limited

Canada Cement Company Building Phillips Square Montreal

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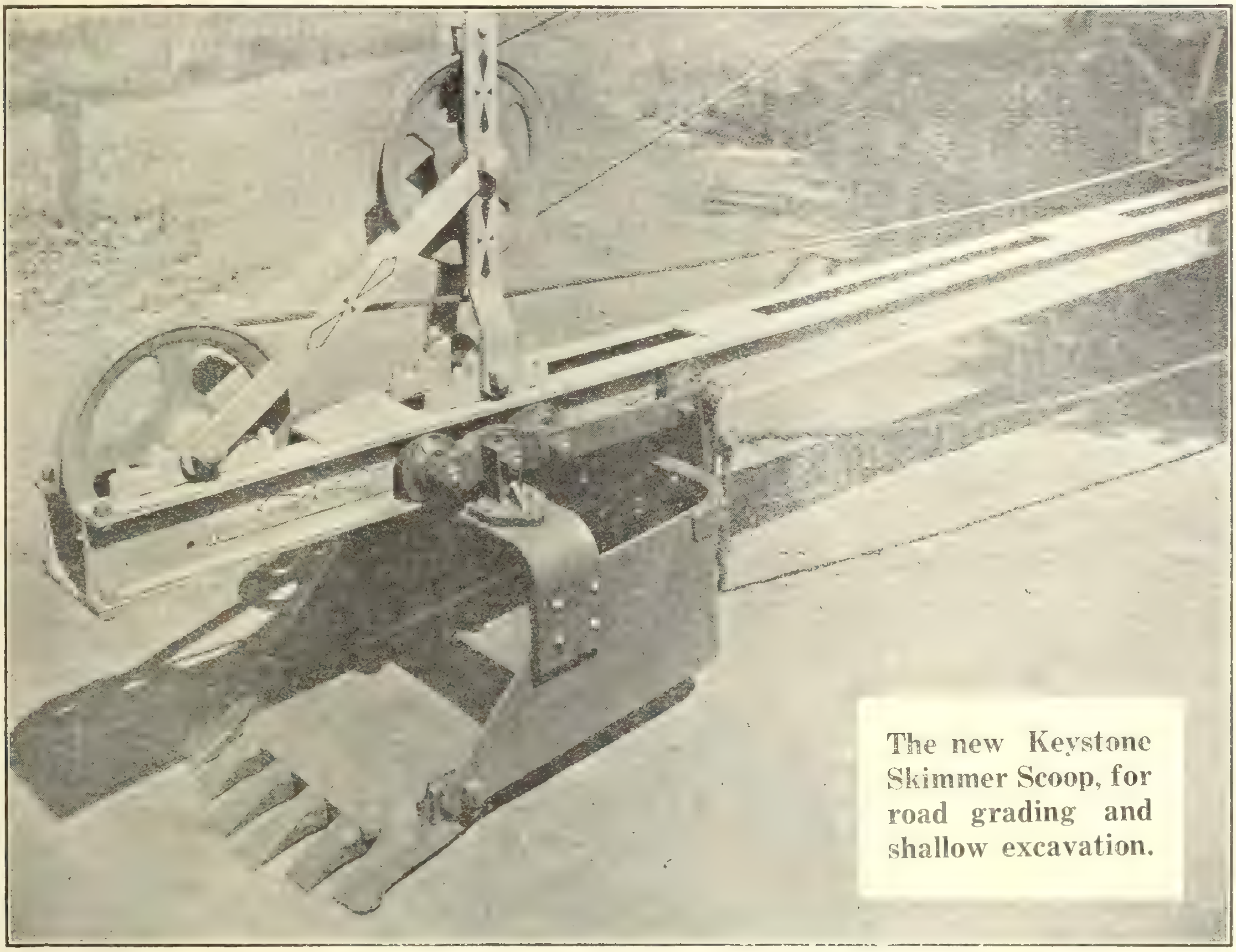


The new Keystone Skimmer Scoop, for road grading and shallow excavation.

Here's where the "Keystone punch" comes in for road grading

New 5-8 Yard Skimmer Scoop

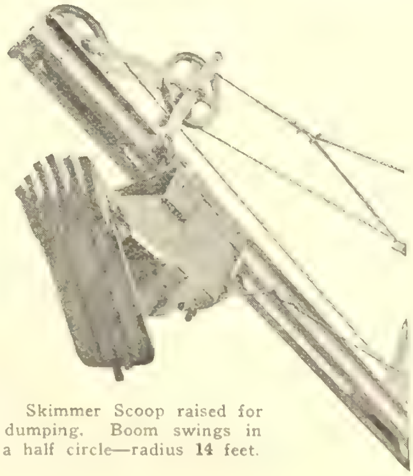
You can see for yourself what a healthy "punch" this Skimmer Scoop has when backed by the 32 h.p., muscle of the Keystone's efficient steam engine. It bites its way into material, filling itself at one thrust. For road making, or shallow excavating from 8 in. up to 4 ft., this Scoop stands without a rival. Capacity up to 400 yds. per day.

It's a simple matter to take off the Skimmer Scoop and replace it with the Ditcher Scoop and then the Keystone is ready for ditching or foundation digging—down to 16 feet—the machine staying on the level, backing up and taking the excavation with it.

Or—a side-hill Dipper Scoop, or a Clamshell Bucket may be attached and used.

The Keystone Excavator, Model 4'23, is far and away the most powerful and versatile general purpose Excavator ever offered. Built entirely in Canada and moderately priced.

Booklet and full particulars on request.



Skimmer Scoop raised for dumping. Boom swings in a half circle—radius 14 feet.

Engineering & Machine Works of Canada, Ltd.

ST. CATHARINES, ONT.

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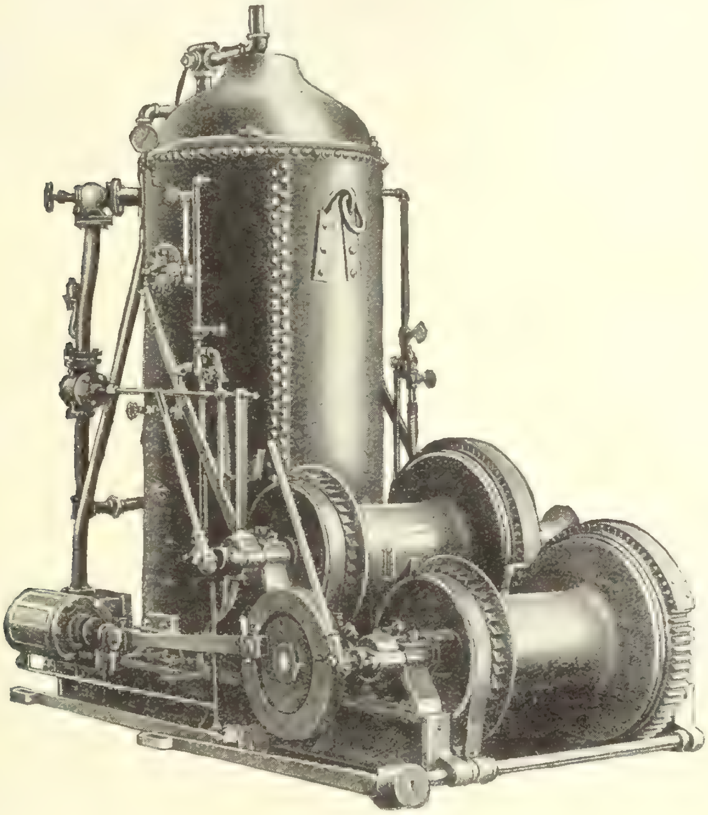
"MEAD-MORRISON"

CANADIAN MM Co

BEATTY STEAM HOIST



Built in Single or Double drum sizes. An additional third drum or swinger can be added at any time.

ORANGE PEEL AND CLAM SHELL BUCKETS
DERRICKS AND DERRICK IRONS

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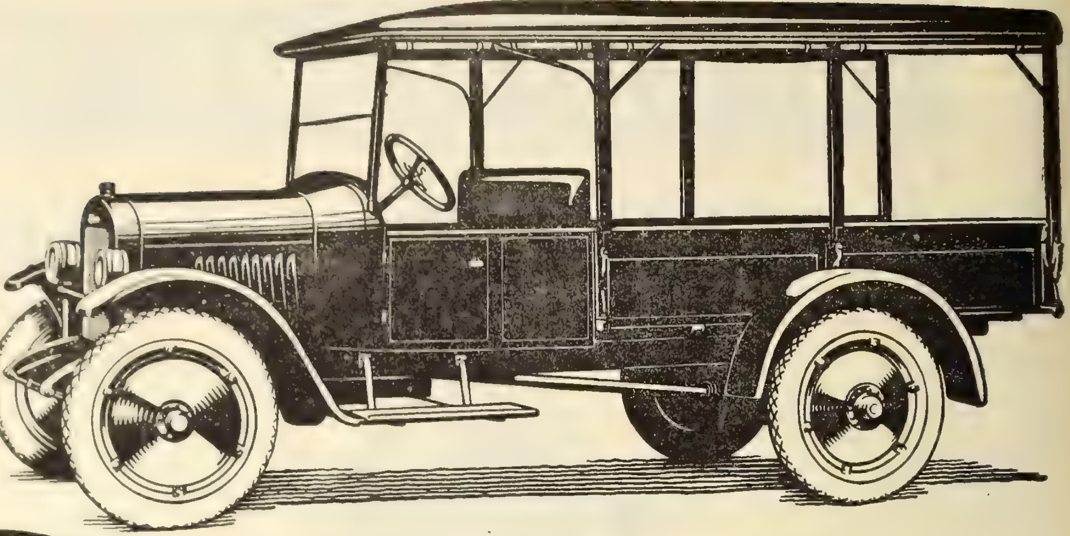
CANADIAN MEAD-MORRISON CO
LIMITED
CANADA CEMENT BUILDING
MONTREAL
WORKS: WELLAND ONT.

The New Stewart 1-Ton Truck

Bodies for Every Business



FOR

$1495

CHASSIS

Matches Trucks Costing up to $2300

Alters All Truck Values— A Simple Way to Prove It

On all major points the new Stewart one-ton truck matches trucks costing from $2000 to $2300 Check the specifications. Or better still come see and compare it with speed trucks costing from $500 to $800 more. Many important standardized parts are the same. In other features Stewart excels even these costlier trucks. The frame for instance is sturdier; bigger bearings; longer, stronger springs. Modern 5-bearing crankshaft motor. Fast, powerful, reliable. Not a one year truck. Built to last for years in steady economical duty. Deep, cushion seats for driver comfort. An examination will convince you. **With body and complete equipment the Stewart one-ton truck costs less than the chassis alone of many trucks which it will out-perform and outlast.**

Disc steel wheels—Demountable rims. Cord tires, 34" x 4½"

A Few of the Many Units in the Stewart 1-Ton Truck, Which Equals Those Used by Far Costlier Trucks

Motor—5-bearing crank shaft. Pressure feed lubricating, automatic control. Removable cylinder head and block. Matches motors of trucks costing up to $2300

Clutch—7 dry plate, multiple disc type with automatic adjustment. Same as in trucks costing up to $2300

Axles—Front, I-beam, drop-forged. Rear, spiral bevel gear, heavy Brown-Lipe differential. All Timken roller bearings. Equal to trucks costing $2300

Zenith carburetor, Remy ignition, starter, generator, Gemmer steering. **All found in trucks costing $2000 to $2300**

Cooling—Cellular type core, pressed steel shell. Extra strong chassis frame, 6" at greatest depth. Equals trucks costing $2000 to $2300

Stewart MOTOR TRUCKS

Distributed by

COMMERCIAL CARS OF CANADA LIMITED
115 Dupont St., TORONTO
Cor. Princess and James St.
WINNIPEG, Man.

AUTO GARAGE HAMILTON LIMITED,
69-71 Hughson St. South,
HAMILTON, Ont.

MUSSENS M LIMITED

PARSONS

"—but don't take our word for it!"

We know how good Parsons Trench Excavators and Backfillers are and we like to talk about them—but since our opinion is based on what they have actually done on the job we like to refer you to any user—he's a booster and he'll give you the net of his experience.

In response to such an inquiry recently, Mr. Affeld, Sec. of the Western Construction Co. of Detroit, wrote as follows concerning our No. 20 Backfiller—

> Having had considerable experience with other makes of backfillers, both steam and gasoline power, we can truthfully say that the "Parsons" is the best in the market both in durability, speed, and cost of operation.
>
> It more than does the work required of it by us as we have at times backfilled some of our competitor's work while working in the same vicinity and did not delay us one minute.
>
> We honestly believe the Parsons Backfiller the best item in our equipment.

That's the way Parsons users ordinarily feel about Parsons equipment—at least that's been our experience for the past seventeen years with hundreds of contractors on hundreds of different kinds of trench work.

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

MUSSENS M LIMITED

Western Dump Cars in Road Work

Modern road engineering often requires excavation which can be handled more economically in small Western dump cars than in dump wagons. The recently constructed road on Dundas Mountain in Ontario, Kansas City's famous boulevard, the "Paseo", Lindale Avenue out of Minneapolis, and many others were built with Western 4-yard dump cars. Ohio's new scenic highway along Ohio River was built with Western 1½-yard dump cars.

Such an outfit can be easily transported and is very flexible, "as flexible as dump wagons," says one contractor speaking of Western 1½-yard cars. "They can do all that dump wagons can do and some things wagons cannot do."

In studying the economic installation for your road contract, you should consider the merits of small Western dump cars for long hauls.

Our dump car catalogue No. 51 describing and illustrating Western dump cars will be sent on request.

Western

That's Why

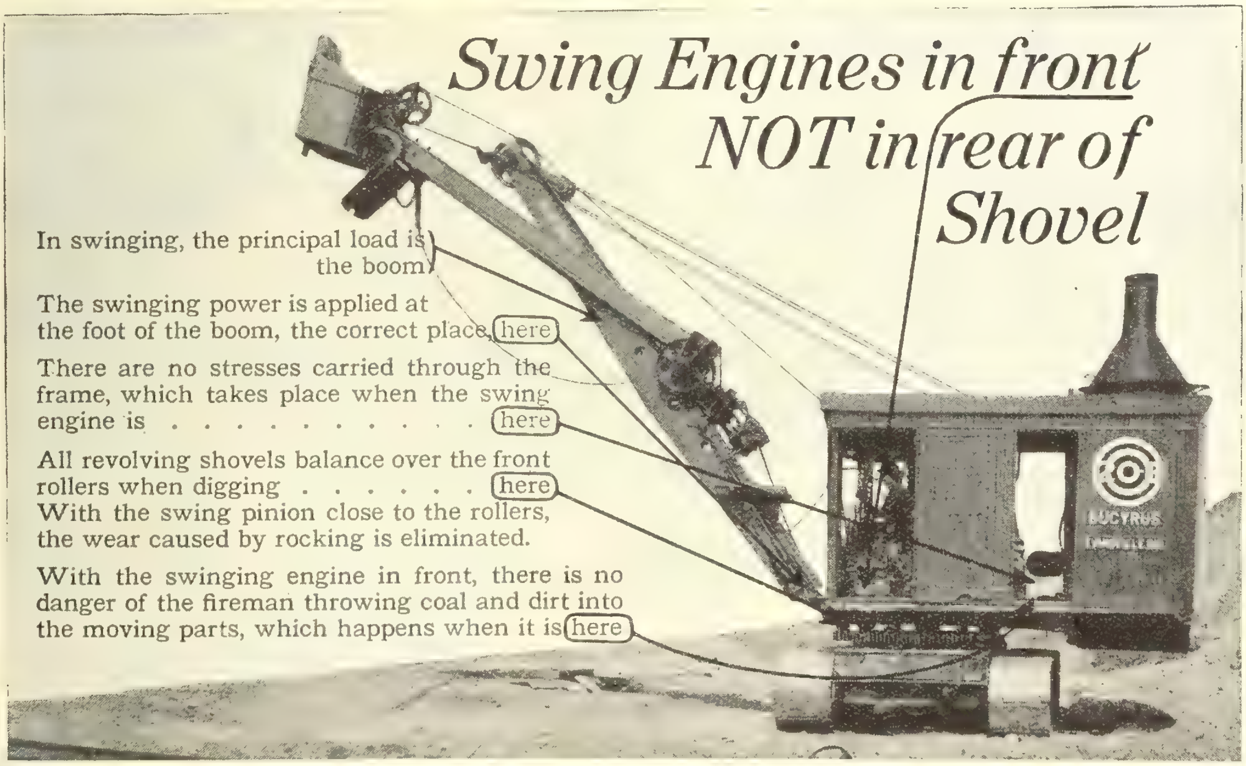
MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

MUSSENS M LIMITED

THIS IS

Found On No Other Small Shovel



Swing Engines in front NOT in rear of Shovel

In swinging, the principal load is the boom

The swinging power is applied at the foot of the boom, the correct place here

There are no stresses carried through the frame, which takes place when the swing engine is . . . . here

All revolving shovels balance over the front rollers when digging . . . . here

With the swing pinion close to the rollers, the wear caused by rocking is eliminated.

With the swinging engine in front, there is no danger of the fireman throwing coal and dirt into the moving parts, which happens when it is here

Furthermore: When equipped as a DRAGLINE, this arrangement makes it possible to mount the Drag Drum further back, thus giving a straighter lead to the Drag Rope—which means a better Dragline.

THIS FEATURE IS FOUND ON NO OTHER SMALL SHOVEL

BUCYRUS

Established in 1880 *A Special Plant Devoted Exclusively to Small Revolving Shovels*

Railroad Type and Revolving Shovels of All Sizes, Dragline Excavators, Trench Excavators, Dipper, Hydraulic and Placer Dredges, Spreader Plows, Wrecking Cranes, Etc.

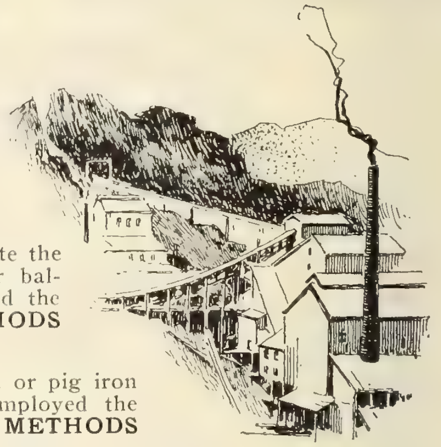
BUCYRUS Small Revolving Shovels are built in following sizes:
20-B—¾-yard 30-B—1, 1 1/3-yard
50-B—1¼ to 2-yard.
Also as Draglines, Clamshell Excavators, Cranes, Etc. Send for Bulletin C-D and state which size you are interested in.

MUSSENS LIMITED

Montreal Toronto

Dominion Equipment and Supply Co., Winnipeg, Man.

"The Seven Ages" OF STRUCTURAL STEEL



The First AT THE MINE

Magnetic Iron and Hematite are the principal ores mined for commercial iron and steel. The operations are characterized by SCIENTIFIC METHODS

The Second ROASTING

The object of this operation is to separate the water, carbonic acid, sulphur and other balatilizable substances. Here also are used the most SCIENTIFIC METHODS

The Third SMELTING

This is the production of metallic or pig iron from the ore. Here also are employed the most highly SCIENTIFIC METHODS

The Fourth STEEL MANUFACTURE

Steel is metallic iron combined with carbon, usually from .5 to 1.5 per cent. The two large processes in general use are known as the Bessemer and the Open Hearth Methods. Both are HIGHLY SCIENTIFIC

The Fifth ROLLING

The process of rolling into **structural shapes** requires steel of excellent quality which has been subjected to most CAREFUL INSPECTION

The Sixth FABRICATION

The fabrication of structural steel is accompanied by accuracy and MECHANICAL PRECISION

The Seventh ERECTION

The erection of structural steel is also conducted with accuracy and precision by SKILLED WORKMEN

Scientific Methods Prevail Throughout

BUILD WITH STRUCTURAL STEEL

Issued by the
Structural Steel Association

FOR SALE

1—Model 76 Marion Steam Shovel.

1—Model 60 Marion Steam Shovel.

30—20 yd. Ballast cars.

1—Railroad Ballast Spreader.

1—Lidgerwood Rapid Unloader.

3—Ballast Plows.

Eastern Equipment Co.
Limited

MONTREAL, QUE. **DORVAL, QUE.**
P. O. Box 792

OSGOOD 29-1 yd. on Highway Construction

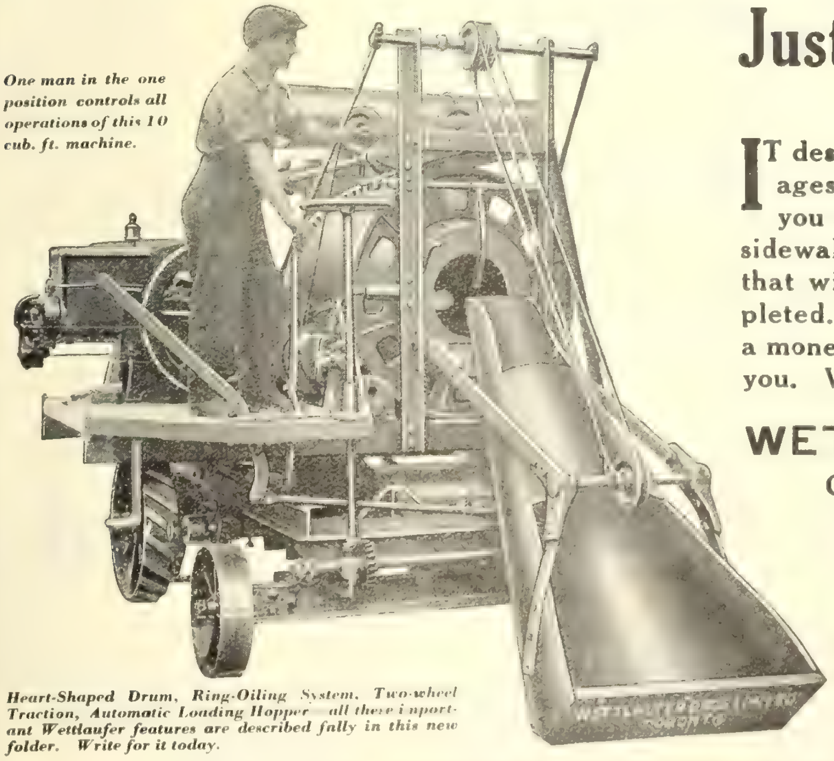
Contract Schedule Delays

Contract Schedule Delays—the most costly item for a Contractor can be greatly averted when Osgood Steam Shovels are used. Their speed and steady operation at low cost is established. Observe their many money saving features. See one operate. Write for descriptive Bulletin. ¾ and 1-yd. Revolving and 1-½ to 6-yd. Railroad Types.

The OSGOOD Company
Marion, Ohio, U.S.A.

WETTLAUFER
CONCRETE MACHINERY

One man in the one position controls all operations of this 10 cub. ft. machine.



Heart-Shaped Drum, Ring-Oiling System, Two-wheel Traction, Automatic Loading Hopper—all these important Wettlaufer features are described fully in this new folder. Write for it today.

Just Issued -- Folder 121

Send For Your Copy Now!

IT describes in full the many features and advantages of this Wettlaufer Combination Paver. If you are figuring on or starting any road Paving, sidewalk or other big construction, here's a machine that will pay for itself long before your job is completed. This 10 cub. ft. machine has proven itself a money-maker for others. It will do the same for you. Write now for full facts. Ask for folder 121.

WETTLAUFER BROS., LIMITED
Concrete Machinery and Contractors' Equipment

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Prepared
Tracing Papers

Superior Tracing Papers

"Vellum" No. V-110 Cream Tint, "Vellum" No. V-120 Natural Tint, "Veltex" No. V-140 Blue Tint.

NOT AFFECTED BY WATER OR VARYING ATMOSPHERIC CONDITIONS

and therefore superior to tracing cloth, as drawings to scale remain accurate indefinitely.

INK, PENCIL, CRAYON, OR WATERCOLORS MAY BE USED

Fast, sharp prints by any process.

A heavy, strong, and exceptionally transparent paper

UNEQUALLED FOR ERASING

Does not deteriorate with age and will not become brittle. Supplied in rolls on large diameter cores, so that it will lie flat on the board. Sheets cut to order.

ORDER THROUGH YOUR DEALER

Samples on request from the manufacturer

GEORGE VINCENT

649 West 43rd St. NEW YORK CITY

"Fire Me"

said a progressive salesman to the Manager. "I am costing the House too much. I am spending so much of my time explaining to prospective customers who I am, who my House is, what my goods are, and why they are worth buying, that I don't have much time left for selling. Do all this preliminary work for me by means of effective advertising before I reach the builder, contractor or engineer. It can be done better and cheaper this way than I can ever hope to do it."

ESTABLISHED 1886
Contract Record and Engineering Review

The wise manufacturer uses the "Contract Record and Engineering Review" not only to save his salesmen time but also to save the time of the Jobbers' salesmen.

The "open door" to the Constructional field is the "Contract Record" which for years has earned and held the confidence of advertiser and buyer.

CEMENT

STONE - SAND - GRAVEL

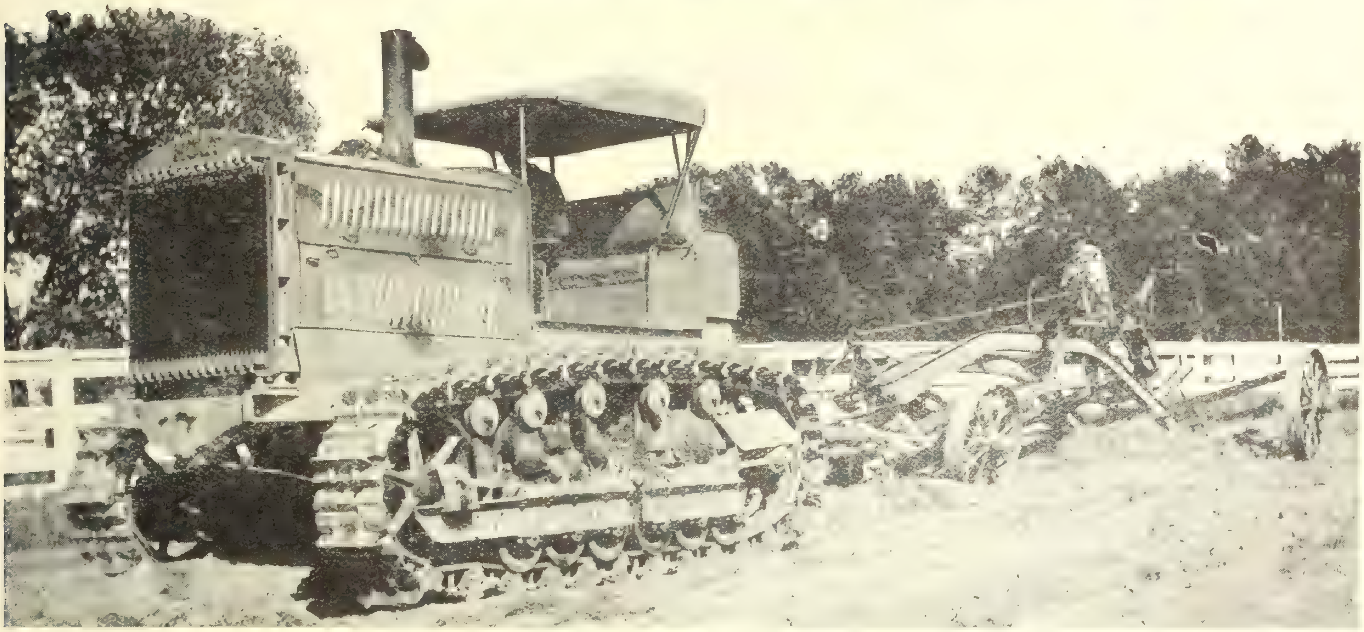
Prompt Delivery

Rogers Supply Company Limited

Toronto, Canada

Adel. 4318 **Adel. 6900**

"CATERPILLAR"



Only HOLT Builds It

Holt invented the "Caterpillar"* Tractor and established it as a positive success in every part of the globe. The "Caterpillar"* Tractor's principles of traction and construction, found in Holt basic patents, were correct from the first. They have stood every conceivable service test. Holt quality has never varied, has never been compromised to meet a price.

"Caterpillar" Performance has been the one standard by which any tractive work could be measured. That is why **the world comes to Holt.** That is why the "Caterpillar" was ready for tremendous military responsibilites. That is why the greatest oil, lumber and mining companies, the most experienced engineers, contractors, road builders, public officials, farmers and ranch owners in over 75 different countries look to Holt to supply the most effective means of doing tasks too difficult and too important to entrust to any method or machine but the "Caterpillar."

This world-wide demand has made the Holt Company what it is today, built the great Holt factories, girded the world with Holt service stations. It has made "Caterpillar"* a synonym in every tongue for **power, traction** and **economy.** Write for our booklet, "Caterpillar" Performance.

CATERPILLAR
TRADE MARK
HOLT

**There is but one "Caterpillar"—Holt builds it*

CANADIAN HOLT COMPANY, LIMITED

1109 St. Catherine St. E., Montreal, P.Q.
Telephone, Uptown 1504

COMPLETE SERVICE STOCKS

Are You One of the Live Dealers Handling this Product?

GYPROC

A Permanent Wall Without Plaster

WE are emerging from the age of paper, wood pulp, fibrous and other inflammable wall boards. The weight of public opinion and the warning voice of our fire officials and fire underwriters are sounding the death knell.

To take their places has come—GYPROC. And here are a few facts which, if you do not already know them, will reveal the cause of GYPROC'S success and the reason dealers are finding it one of their most profitable specialties.

GYPROC IS THE ONLY FIRE-PROOF WALL BOARD ON THE MARKET.

It won't warp, buckle, shrink or crack. Is strong and rigid, is quickly and easily applied. Can be Painted or Wall Papered. Coldproof and Heatproof. A Perfect Insulator. Saves Fuel. Resists Sound. Is Verminproof. Costs no more than ordinary Wall Boards.

And its uses are legion.

GYPSUM PRODUCTS

If you have not complete data describing Gyproc Wall Board, Gypsum Board, Gypsum Block and Gypsum Plaster, on file, drop us a card and they will be forwarded immediately.

The Ontario Gypsum Company, Limited

Head Office: PARIS, ONT.

Toronto Offices: 106 Don Esplanade Montreal: 10 Cathcart Street,
Windsor: 30 LaBelle Bldg. Factories: Caledonia, Ont., Lythmore, Ont.

THIS is a special advertisement, printed for the younger men who use steam shovels and cranes —the men who have started in construction work within the past few years. If you have been in this line of work for ten years or so, these questions and their answers will be an old story— you not not read any farther **unless you want to refresh your memory.**

Who was the first steam shovel builder to use 3-lever control— making it easy for one man to govern the entire shovel operation, with only 3 levers instead of 4, 5, or 6 levers?

Who was the first to rate a ¾-yd. shovel to dig 50 to 60 cu. yds. an hour in bank work, instead of 30 to 40 cu. yds. —and then have many yardages run above the new high rating?

Who was the first to provide a reliable swinging mechanism with the load carried between large bearings— a swinging mechanism which was not frequently breaking down?

Who was the first steam shovel builder to provide an auxiliary exhaust, so that forced draft may be used only when the fire requires it?

Who was the first to provide steam shovels with a worm-gear-driven power-operated boom hoist?

Who was the first to fit the dipper handle with wear-resisting drop-forged racking which lasts as long as the dipper handle itself?

Who was the first to use a shipper shaft and pinion cast in one piece— much stronger construction, and costing no more than a pair of pinions only?

It pays to use equipment that is *"ahead of its time"*

Who was the first to build a ¾-cu. yd. steam shovel with long enough reach to dig an 8-ft. cellar without bringing the wagons down into the hole?

Who was the first to build a real ¾-yd. steam shovel easily convertible to a real practical locomotive crane, highly efficient on clamshell and dragline work?

Who was the first to use an indestructible one-piece open-hearth steel truck frame, with all the bearing boxes an integral part of it?

Who was the first to provide a traction wheel shovel with a power steering device that could be hooked up in about 10 seconds, instead of as many minutes?

Who was the first steam shovel builder to use a centre pin easily removable from above, making it easy to dismantle the shovel without jacking up the cab over the centre pin?

Who was the first to provide steam shovel engines with dustproof covers to keep out dirt and grit?

Who was the first to reduce vibration of the hoisting engines by tying the cylinders together, with a rigid bridge forming the cylinder head and central reverse valve chest?

Who was the first to build steam shovels on the interchangeable duplicate plan, ensuring perfect fit of renewal parts?

Who was the first steam shovel builder to use case-hardened eccentric pins, cross-head pins, and lever connections— eliminating rapid wear and lost motion?

Who was the first to use bent piping instead of fittings —and flanged pipe connections instead of direct tapping into large castings?

Who was the first to set the hoisting engines back of the centre pin and make the cab roomy, with all working parts easily accessible?

Who was the first to strengthen the general-purpose steam shovel dipper, and increase its opening clearance by **building the bail into the dipper?**

Who was the first steam shovel builder to provide, as standard equipment, an automatic trip-rope tightener to keep the trip rope taut and speed up the dumping?

Who was the first to make a hinged stack easily thrown back to expose every tube in the boiler, for easy tube cleaning?

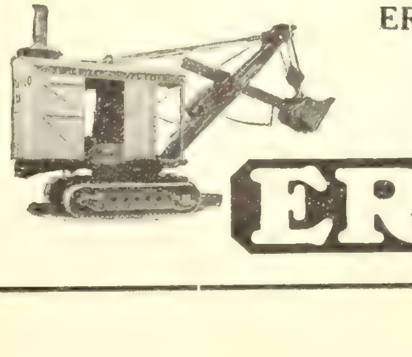
Who was the first to build a steam shovel caterpillar type mounting with durable steel treads— steered by power — fully lubricated at every bearing point— and in every way as reliable as traction wheels? (There are now more than 800 caterpillar type Eries in service).

The correct answer to every one of these questions is "Erie"— as is well known by all of the "old-timers" who have kept in close touch with steam shovel progress.

AND THESE ARE ONLY A FEW of hundreds of important improvements— actually **hundreds** of them— all made by the same "**who**". Numerous improvements which have given the Erie Shovel a wide reputation for greater output and UNEQUALLED RELIABILITY.

The same progressive designers are still on the job here. They have marched in front during the past ten years, and are not content with any place except at the head of the parade.

When you buy an Erie Shovel or Crane, you get a machine that is actually several years ahead of its time. **It pays to use machinery like that.**



ERIE STEAM SHOVEL CO., Erie, Pa., U. S. A.
Incorporated 1883. Formerly Ball Engine Co.
Builders of Erie Steam Shovels, Locomotive Cranes, Railway Ditchers
Export Representatives: Gaston & Co., Inc., 165 Broadway, N.Y.

ERIE Revolving Shovels — Erie Steam Shovel Co Erie Pa

Jamaica Knows Domtar

DOWN in the sunny south, the value of Domtar as a road building material is recognized.

The photograph shows a stretch of the heavily travelled Spanish Town road which is surfaced with Domtar-2. This road has stood up under the hardest kind of service to the great satisfaction of the officials and those who pay for its maintenance. It is an excellent example of how a people can secure good roads at minimum expenditure and is a tribute to those responsible for the work.

North, south, east or west—it is all one to Domtar. No matter where your town is located or the conditions of traffic—Domtar will give you "good roads at least cost." Ask our engineering department. It is at your service.

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ESTABLISHED 1886

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Estimating Practice Needs Improving

That contractors are intensely interested in reading articles on estimating topics is indicated by the large number of letters that the editor has received commenting favorably on the series of articles in the Contract Record by Chas F. Dingman. One reason, doubtless, for this interest is the present lack of good literature relating to estimating, which makes articles like Mr. Dingman's eagerly sought for and read. Of course, the practical soundness of the author's ideas gives them a merit which readers must appreciate, but a point which must be emphasized is that contractors are looking for just the kind of information that this series of articles contains.

A better knowledge of estimating procedure is certainly needed by the contracting profession—needed because contractors, as a whole, are not conducting their businesses along lines that are thoroughly sound. The contractor whose office is under his hat is still with us and if he succeeds in accumulating a competence, it is not because he has adopted business-like tactics or principles. That is why there is a big turnover in the contracting business—a constant influx of new adventurers whose experience generally leaves them sadder if not wiser. Thus it is that contracting has come to be regarded as a hazardous undertaking.

A correct knowledge of estimating is one of the first requisites of sound business conduct and with it must go hand-in-hand a knowledge of cost keeping, for the one is dependent on the other. If a contractor knows how to find his costs and then uses this information as a basis of estimating, he cannot but make sure of showing a profit from his undertaking. The losses which contractors have to take are largely due to "guessing" at the expected cost instead of "estimating." The difference is just the difference between loss and profit. Anything that will lead contractors, therefore, to estimate more carefully and more accurately, should be readily accepted. For that reason Mr. Dingman's articles are being widely read.

Industrial Conditions as Seen by Our Banks

Canadian banks are generally credited with being very conservative. If they are criticized it is along this line. It should encourage us all the more therefore when they show signs of optimism.

The Royal Bank of Canada, second only in size of capital to the Bank of Montreal, in the latest copy of its Bulletin, discusses relative industrial activities in the United States and Canada. It is pointed out that we are not enjoying anything so nearly approaching a boom as our neighbors to the south, but that this may be accounted for in that the war left the United States with a much larger proportionate increase in wealth than was the case in Canada. History also shows that fluctuations in our industrial conditions are never as extreme—either up or down—as they are in the States; also that we are dependent to a proportionately greater extent on agriculture—which has had two or three bad years.

After discussing the reasons for the less favorable conditions in Canada and preparing the reader for a more or less pessimistic conclusion, the tone of the article changes and leaves one surrounded with a decidedly encouraging atmosphere. It is pointed out that our export trade continues to improve and at the moment three times as great on a per capita basis as that of the United States; that certain steel and other orders have been received in Canada at prices higher than those ruling; that the pulp and paper industry continues very active, that stocks of lumber on hand have been well cleared out; that agricultural conditions are improving and that, after all, the business cycle in Canada lags about six months behind the United States. The article concludes with the following statement: A comparison of conditions in Canada with those which obtained in the United States a few months ago seems to justify the belief that **the degree of improvement which has already commenced will gradually increase and that Canada will experience a business activity, comparable at last, to that which now exists in the United States.** Such a movement would not necessarily be dependent upon the continuance of the upswing in the United States.

Labor Organization in Canada, 1922

The figures published in the Twelfth Annual Report on Labor Organization in Canada, covering the calendar year 1922, which has just been issued by the Department of Labor, show that during the three-year period from 1920 to 1922 there has been a decline in trade union membership in Canada of 101,426, the loss in the last calendar year being 156 in branches and 36,699 in members. The total membership of all classes of trade unions in the Dominion at the close of 1922 stood at 276,621, comprised in 2,512 local branches. There are in all 92 international organizations operating in Canada, and between them they have 2,108 local branches in the Dominion, with a combined reported membership of 206,150. These figures indicate six fewer international organizations operating in the Dominion, with losses of 115 in branches and 16,746 in members. There are eighteen of what are termed "non-international" organizations, an increase of three over the year 1921, with totals of 272 local branches and 22,973 members, a gain in branches of eight, but a decrease in membership of 1,507. The number of independent units of trade union organizations has decreased by two, there now being 25 such bodies, the reported total membership being 9,063, a loss of 6,581. The unions commonly known as "National and Catholic" number 106, with a reported membership of 38,335, a decrease in unions of 14 and in members of 6,635. Of the 34 local units of the One Big Union which were in existence in 1921 only one reported, as the general offices of the body refused to furnish any information as to its standing, all of the non-reporting branches have been dropped from the report. The figures recorded above indicate that, although the international organizations had the heaviest decrease during the year 1922, this group represents approximately 74 per cent of the total trade unionists in the Dominion. The membership of all classes of organized labor in Canada, as reported to the Department for the past twelve years, has been as follows. 1911, 133,132; 1912, 160,120; 1913, 175,799; 1914, 166,163; 1915, 143,343; 1916, 160,407; 1917, 204,630; 1918, 248,887; 1919, 378,047; 1920, 373,842; 1921, 313,320; 1922, 276,621.

The 2,512 local branch unions of all classes in the Dominion are divided by provinces as follows: Ontario, 1,045; Quebec, 456; British Columbia, 235; Alberta, 209 Saskatchewan, 163; Manitoba, 134; Nova Scotia, 147; New Brunswick, 114; and Prince Edward Island, 9.

Trade Union Beneficiary Features

The report also contains information as to expenditures made by labor organizations for benefit purposes, the disbursements amounting to many millions of dollars. Of the 92 international organizations operating in Canada 58 reported the amounts paid out during 1922 for one or more benefits, the expenditure for each class of benefit being as follows:

Death benefits	$8,515,123
Unemployed and travelling benefits	753,704
Strike benefits	13,549,717
Sick and accident benefits	1,446,408
Old age pensions and other benefits	2,113,777

Four of the eighteen non-international organizations reported having expended $41,180 for benefit purposes, the largest amount ever expended in any one year for benefits by these bodies. The disbursements for benefits by the international organizations also show an increase of $2,288,893 over the expenditures for 1921.

Besides the expenditures of the central bodies a statement is also published in the report showing the amount paid in benefits for the year 1922 by local branch unions in Canada to their own members. The amount disbursed aggregated $535,450, a decrease of $968,105 over the previous year.

Other Important Features of the Report

Besides the statistics furnished, the report gives particulars concerning certain revolutionary labour organizations of recent formation and the doctrines which their promoters are endeavouring to propagate in Canada as well as in other countries. The volume also contains much general information as to the activities of organized labour in Canada, as well as references to important labour events both at home and abroad. As a directory of trade unions the report is very complete, containing particulars of every known local trade union in Canada, and also lists of central organizations and delegate bodies, together with the names and addresses of the chief executive officers for the year 1923. A chapter in the report is devoted to an important class of organized wage earners who are not connected with the organized labour movement, included in which are associations of school teachers, commercial travellers and government employees. In all there are 63 such bodies having a combined reported membership of 81,373.

New Publications

The Erie Steam Shovel Company, Erie, Pa., are distributing a new bulletin, S—60, dealing with Erie Caterpillar type mounting, describing in detail the lubrication system and the bushing of the link pin bearings, which are exclusive Erie features. These two special features of the Erie Caterpillar type mounting are claimed to have resulted in a saving of many thousands of dollars to shovel owners.

The 1923 edition of "5,000 Facts About Canada" has just made its appearance. This little handbook, which is compiled by Frank Yeigh and published by the Canadian Facts Publishing Co., Toronto, is a valuable compilation of interesting data compactly arranged, relating to Canada, her people, industries and resources. It is now in its 20th year.

The ninth annual report of the Ontario Safety League has been issued. It comprises a summary of the work of the League for 1922, as well as a reference to the activities of the Canadian National Safety League.

Large Six-Storey Building for Henry Morgan & Co. Moved 259 Feet

To Make Way for an Extension to Montreal Departmental Store, Old Structure 44 ft. by 90 ft., Was Moved to New Site by a Method That is Unusually Interesting

At the present moment construction is under way on a large extension to the department store of Henry Morgan & Co. Ltd., Montreal, whose old store has been a landmark on Phillips Square for many years. This new extension is being built on the rear of the old store and occupies a large area between Union Ave. and Aylmer St. In fact the new addition is to be larger than the present store.

In the natural course of events a number of important buildings had to be demolished to make way for the new structure. These were mainly old houses which had been standing for many years, though still in a fair state of preservation when torn down. However, there was one building which was much larger of modern reinforced concrete construction, difficult to demolish, and in any case too good a building to destroy. This one they decided to move bodily into the furthermost corner of the site where it would not spoil the general architectural scheme of the new structure.

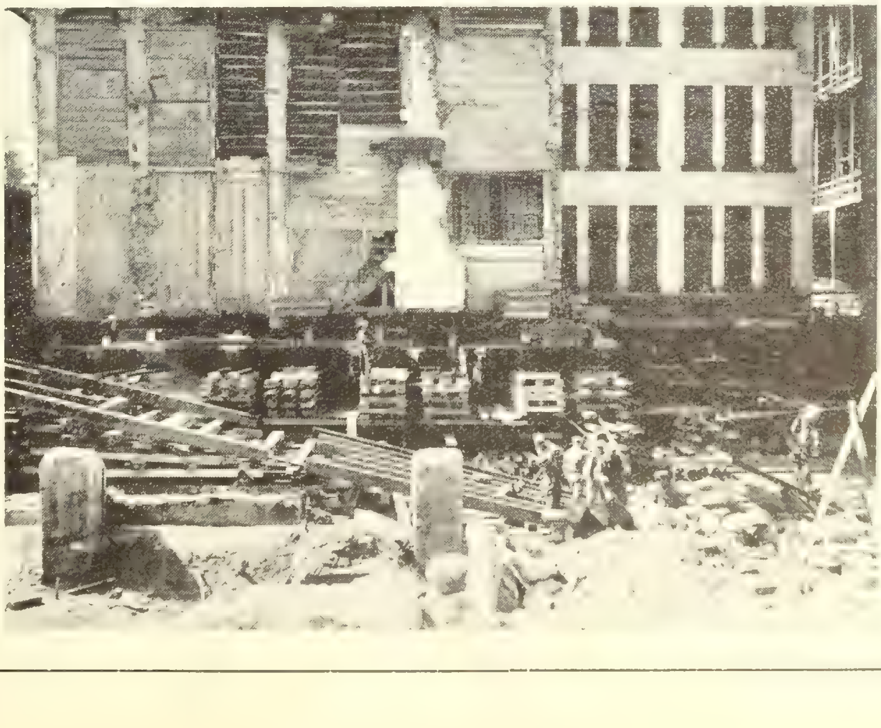
A brief description of the building is necessary before entering upon the details concerning the methods adopted in moving it. As stated before, it is of reinforced concrete throughout, designed according to the best known practice in use when it was built, namely column, beam and slab construction. It is approximately 44 ft. wide by 90 feet deep with a smaller rectangle taken out of one of the back corners. It is six storeys high above grade (street level) and had a shallow basement, the basement floor being well above footing elevation. The front wall is of stone with brick backing and the other walls are of solid brick.

A firm of contractors from Chicago, Ill., who are familiar with moving work was asked to undertake the task. They have to move it in a straight line parallel to Union Ave., for a distance of about 259 ft. and lay in on foundations which have already been put in to receive it. All the earth between has been excavated to the level of the basement of the new building so that considerable cribbing up will be necessary in order to keep the moving building at its present elevation. They do not propose to erect cribs over the whole distance before a start is made but will use the cribbing left free as the building advances. This cribbing is about 12 ft. high from ground level to the level of the rollers under the skids. It merely consists of squared timbers laid alternatively longitudinally and transversely. The

Interesting Statistics at a Glance

Interior bracing	20,000 F.B.M.
Weight of building	5,500 tons
No. of jacks used	900
No. of rollers used	700

Amount of timber used:
190,000 f.b.m. of 6″ x 6″
130,000 f.b.m. of 3″ x 16″
Length of cable used, about 6,000 ft.
Power applied to building through continuous cable, 3,800 h.p.
Progress.
1st day's moving, 57′-6″ (3½ hours)
2nd day's moving, 51′-6″ (4 hours)
Amount of steel in the cribbing as supplementary, 135 tons, mainly heavy I-beam.
Amount of steel beams above the skids (140 tons).
Dimensions of building, 44′-0″ wide, 90′-0″ long and 90′-0″ high.

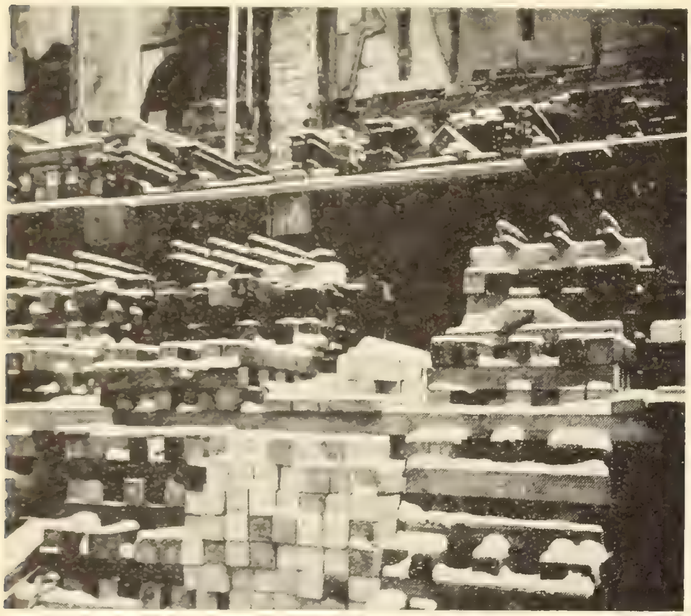


Cut showing south wall. Canvas held in place by battens is where no brick wall was originally placed. Concrete foundation piers in foreground originally supported the north wall.

timbers in each series are not laid touching but have a space about 6 ins. wide separating them. The timbers on the ground are laid quite close; in fact almose touching each other, side to side and end to end, so that the weight of the building will be more widely distributed and cause no great depression of the ground. In this manner the cribs are built up to the level of the steel rails upon which are the steel rolers.

Rails and Rollers

These steel rails are laid in the direction of movement of the building and are the heaviest type of railway rail available. They are laid directly on top of the cribs and shimmed up so as to be level throughout their entire length. This necessitates careful construction of cribs as large shims may not be inserted directly under the base of rail for fear of slipping out under the tremendous pressure. There are rails on each side of each column line, laid so that no two joints come opposite and so that the continuing rails overlap about 8 ft.



Close-up of small section of north wall showing method of placing cribbing and "needle-beams."

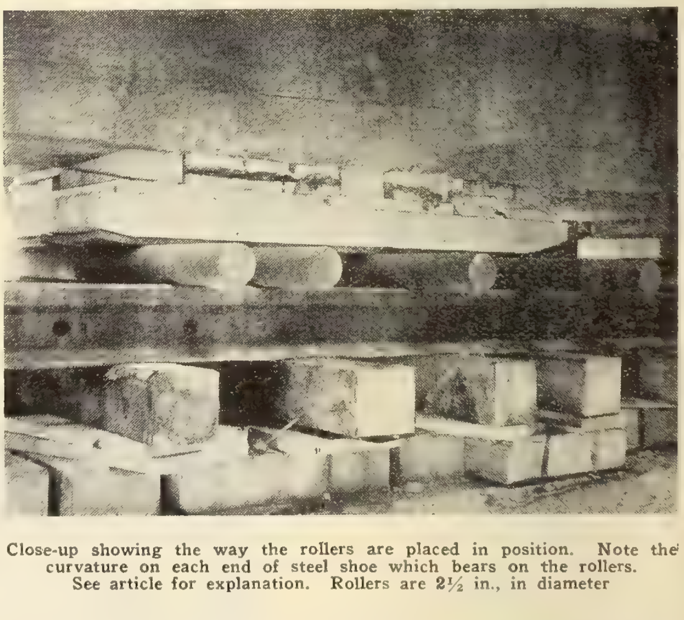
Running on the rails are steel rollers which in their turn carry the pressure into flat steel plates reinforced by hardwood planks 3″ thick. These plates are bent up slightly at both ends so that the rollers will work their way under the plates as the building moves forward. The rear end of the plate is also bent up slightly so that the rollers will be released gradually, when the plate has advanced far enough. What is meant by saying that the plate advances is that everything above the rollers, including the plates, moves forward when the tension is applied to the cables.

The steel plates are a very necessary part of the equipment and must be carefully bent to get the proper angle to conform to the diameter of the roller. Thus, with steel bearing against steel on both top and bottom of the rollers, these may be "cut" at any angle to alter the direction of movement of the building. In this instance the building is to be moved in a diagonal direction for a couple of feet to draw it away from the building at the rear where the walls are touching. The rollers will then be "cut" back to their original position.

Bracing the Interior of the Building

The reader will recall that the building is of reinforced concrete throughout. The contractors decided to brace the interior of the building by means of heavy squared timbers in order to make the framework double strong to resist or take up any unequal stresses that might be brought upon it during the process of jacking up and moving. This wooden auxiliary framework will supplement the reinforced concrete frame of the building. The heaviest framing is on the ground floor and the remaining framework is reduced in weight and strength as each succeeding floor is reached. The top two floors are very lightly braced. In other words the strength of the frame (auxiliary) is in direct proportion to the original frame of the building, heavy and strong at the ground floor and light at the top floor.

It will be remembered that considerable area of both side walls of the building did not have integral brick walls, the walls of the building on either side being used as parting walls with plaster applied directly to them. The concrete columns were built touching these walls and above the third storey, where the old wall stopped, the columns were haunched outward and from this point upwards carried wall beams to support the brick. Thus it will be seen that wall beams were only used in the newer building where new brick walls were built and where the parting wall was already in place the floor slab of the later building was poured right up against it. When the buildings on either side were demolished gaping holes appeared in the side walls of this building, criss-crossed in both directions by the columns and floor slabs. These floor slabs had to be carefully and strongly braced where no beams occurred. Outside of this area the wall beams acted as bracing and the integral brick walls acted as further bracing, thus avoiding the very heavy framing.



Close-up showing the way the rollers are placed in position. Note the curvature on each end of steel shoe which bears on the rollers. See article for explanation. Rollers are 2½ in., in diameter

In all, about 20,000 f.b.m. were used in the interior auxiliary framework of the building.

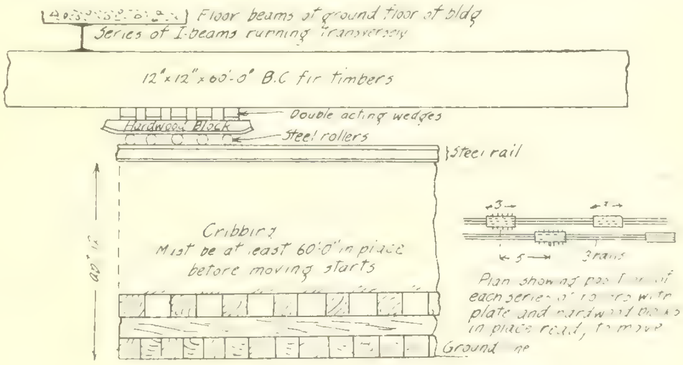
One of the accompanying cuts shows the direction of movement of the building in changing its location. The main concrete beams in the building also run in this same direction. It is necessary that these two factors should be considered when putting the skids under the building which are its main supports during the lifting and moving process.

The main skids upon which the building is supported and which move with it are 12″ x 12″ B. C. Fir about 60 ft. long which means that they project about 10 ft. on each side of the building. The first thing done was to cut holes in the side wall opposite each other and on each side of the line of columns so that these skids could be put through. They were then raised up on blocking and the screw-jacks placed underneath. Across these timber skids heavy 20″ I-beams were placed in a position at right angles, a beam close up to each column on each side and several between the columns. Heavy timber "spreaders" are placed between the beams to prevent any sidewise movement. The outside walls where the heaviest load occurs, are supported at frequent intervals by "needle-beams" which rest on heavy I-beams running parallel to the wall both inside and outside. These I-beams like those under the building itself are supported on the timber skids.

View of cribbing in advance of north wall. Note the timber mat foundation in the right foreground.

The real process of "jacking-up" did not commence until all these "needle-beams," I-beams, etc., were in place and all bearing evenly against some point of support in the building. Any small irregularities in the blocking were taken up by driving in hardwood wedges and blocks. This occurs more especially where the needle-beams pierced the foundation walls as it was not economical to spend too much time in cutting the foundation walls too carefully. Hardwood blocks driven in on top of the wide beams and bearing against the foundation wall are quite solid enough to withstand the required pressure.

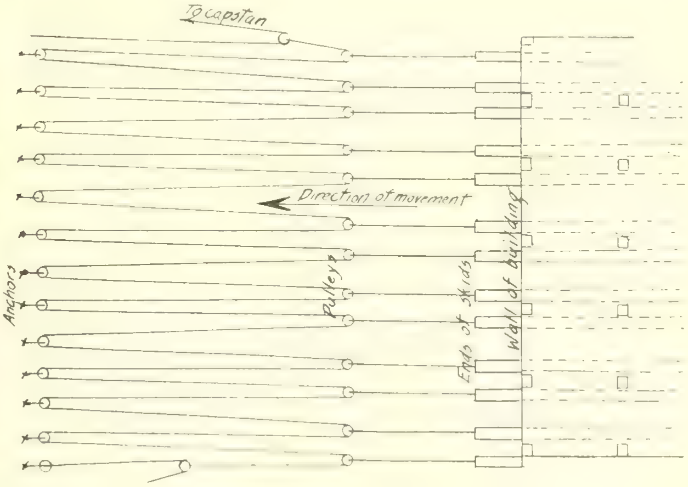
In the meantime while this progress of placing the skids was going on, a temporary foundation was being laid on cellar floor, consisting of heavy timbers laid close together. This temporary foundation was really a mat-footing of timbers overlying the concrete floor and was intended to support the building when it finally rested on the jacks, and foundations were cut loose.


Floor beams of ground floor of bldg
Series of I-beams running transversely
12″x12″x60′-0″ B.C fir timbers
Double acting wedges
Hardwood Block
Steel rollers
Steel rail
Cribbing
Must be at least 60′-0″ in place before moving starts
3
5
3 rails
Plan showing position of each series of rollers with plate and hardwood blocks in place ready to move
Ground line

Details of method by which building is supported

It should be remembered that the skids and the I-beams were being supported temporarily on jacks and were raised some 3½ ft. above basement floor. No other weight was at this moment on the jacks except this supporting grillage, the building being still on its original foundations.

The next procedure was to build up the timber grillages under the skids, basing them on the timber mat which covered the cellar floor and bringing them up to the level where the jacks were to be inserted.



Arrangement of tackle

Having completed this the jacks were then placed in their correct positions and prepared for the duty of assuming the load of the building. Seventy jacks were placed under each skid in such a way that they did not come directly opposite to each other on two consecutive skids, i.e., they were staggered. The tops of the jacks which were on the skids had steel caps on them to distribute the pressure and the sleeve or collar through which the spindle went had its bearing on a split hardwood block. These split hardwood blocks rested directly on the cribbing, with the jacks thus in position throughout, the next job was to apply the pressure. This was done by several men who gave each jack in order a half turn which was finally reduced to less than a quarter revolution as they offered greater resistance. It soon became evident that they had raised them sufficiently to take up all the shrinkage in cribbing and also put considerable stress on the building itself. This point cannot be determined theoretically on account of uncertain factors but Mr. LaPlant, president and chief engineer of the LaPlant-Choate Mfg. Co., the contractors for the moving, has had wide experience which has told him how much pressure it is necessary to have on the jacks to take up shrinkage and properly support the building.

When this point was reached it was only necessary to cut the building loose from the concrete foundations. This was done by an air drill to break up the concrete and an electric torch to cut the reinforcing steel.

Interesting Problems

In work of this kind it is not always possible to apply definite scientific theories in the treatment of the various problems that arise, but an extensive practical experience is of more value. Mr. LaPlant, the owner and chief engineer of the company, is a man whose theoretical knowledge has been supplemented by a wide experience in this branch of engineering work, so that he is eminently suited to start moving even the large buildings. Although this is a large building, and probably the only one of any size that has been moved in Canada he tells our correspondent that his work else-where has been on a greater scale.

There are various problems arising out of a job of this nature some of which might be solved easily and others which would not submit to the application of any rules or formulae found in books.

Principal among the latter problems is the one wherein it is necessary to allow a certain amount of shrinkage in the timber used in building cribs to support the building. Certain kinds of timber will shrink more than others when subjected to heavy loads, and the problem is to determine how much shrinkage to allow for in a timber crib so many feet high and made up of a certain kind of timber.- Complete knowledge only comes after complete experience and both are not quite obtainable where factors are so uncertain.

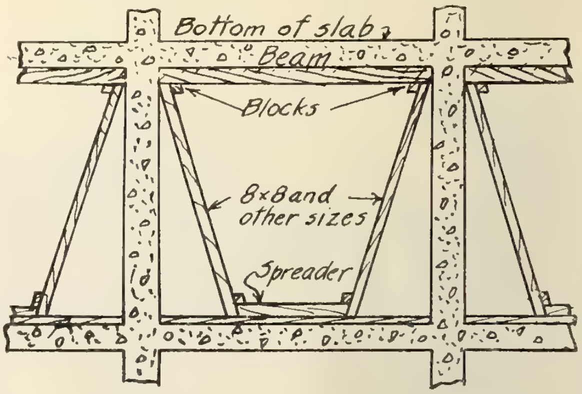
According to Mr. LaPlant the procedure is about as follows:

A soil bearing test was made in the completed excavation adjacent to the north wall of the building which showed them how much the ground would depress under certain loads. This soil bearing test was taken accurately for various loadings per sq. ft. They then estimated the total load of the building which was found to be in the neighborhood of 5,500 tons. Knowing the soil bearing capacity and the weight of the building it was then determined how wide it would be necessary to build each crib under the skids.

Determination of Shrinkage

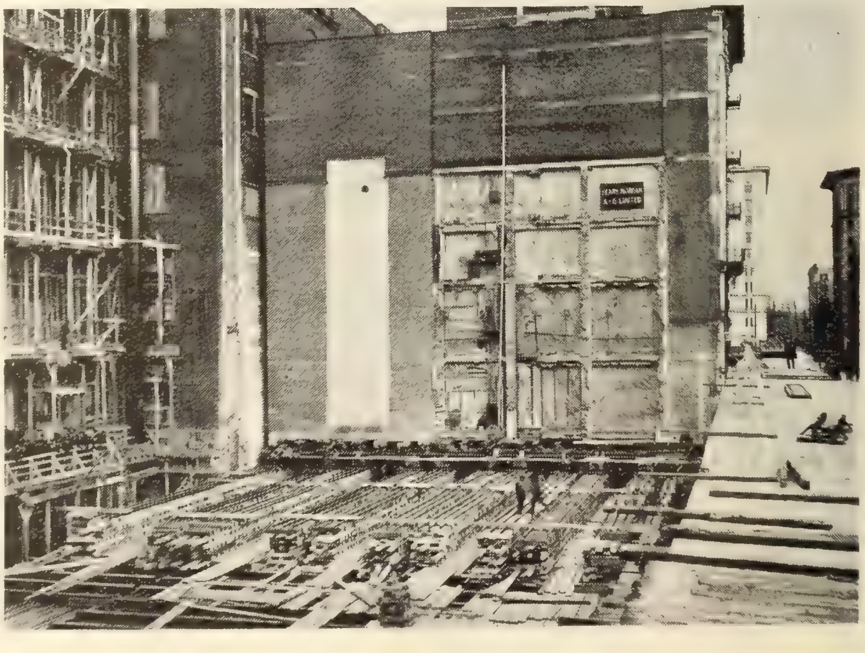
There was still the factor of shrinkage of the timbers to be taken into account and this was determined in the following manner.

Outside the area of the building on both sides the excavation had been completed to basement level of the new store. This elevation is about 12 feet below the base of rail, and about 8 feet below the basement level of the building under discussion. Thus the cribbing under the building when in its original position is 4 feet high but is 12 feet high just outside the walls, each measurement being taken to base of rail.



Typical panel of interior timber framework

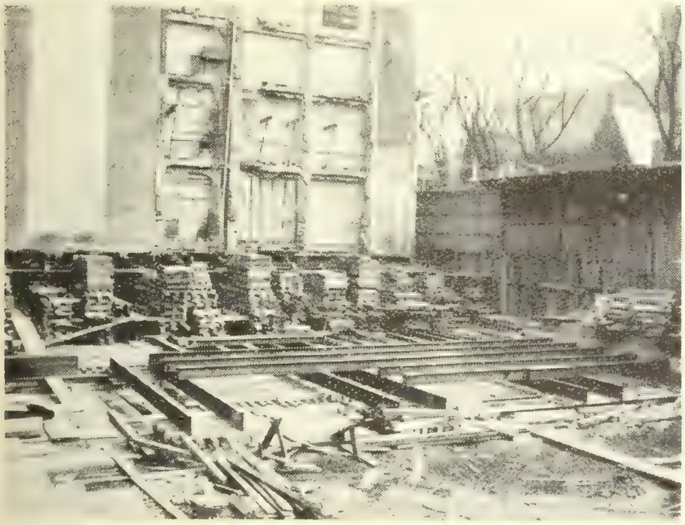
The jacks were placed in such a way, both under the building and outside the walls, that each jack would assume an equal share of the load. This implies that the building is entirely supported on the



Position of the building at the beginning of the second move.

jacks, and cut loose from its original foundations, the base of rail must be at a constant elevation throughout its entire length. Knowing the class of timber being used they estimated what the shrinkage would be in a certain height of cribbing. Also knowing the bearing capacity of the soil they allowed for a certain depression under the cribs which were outside the walls. No depression was allowed for under the building as the concrete floor distributed the weight over a large area. Their estimate for shrinkage and depression of the cribs was 3 in., and the actual amount when the building was loaded was 2⅞ in.

It can be readily appreciated why it was so important to have this information complete and exact before proceeding to move. It is most essential that the building should be maintained on a level footing throughout the process and also at a constant level, so that the cribbing ahead of the building must be built to a level 2⅞ ins. higher than that directly under it. Thus there would appear to be a tendency to run uphill; but this is not the case actually as the cribbing depresses a certain amount as each set of rollers passes over it. When the last set of rollers has passed onto a certain section it will be found that that section has gone down 2⅞ ins. This is an important point to remember.



View of north wall. Steel grillage in the forground is resting on the piers of the new Henry Morgan building. Timber cribbing was built on this grillage for the major part of the distance

This was supplied by four horses, 2 each on two capstans which were anchored outside the area of the site, one on Union Ave. and the other on Burnside Ave. The capstan had a diameter of 16 in. and the sweep or arm was 16 ft. long from the centre of the capstan to the point where the horses were pulling. Under these conditions the horses were exerting a pull of about 100 h.p., which was the amount transferred to the cable leading from the capstan. Total applied energy was therefore about 200 h.p. at the capstans. This was increased to nearly 4,000 h.p. at the building by means of a continuous cable passing over a double system of steel pulleys. The accompanying diagram illustrates the manner in which this result was achieved. Allowing 10% loss of power due to friction in the pulley and other losses we have:

$$2\ [\ (100+90)+(100+80)+(100+70)+(100+60)$$
$$+(100+50)+(100+40)+(100+30)\ ]$$
$$=2\ (1{,}120)=2{,}240 \text{ h.p.}$$

By the addition of a snatch block or pulley on each outside cable we double this power i.e., 2x2,240 =4,480. Allowing 10% for loss we have finally 4,480 —448=4032 h.p. This would be the result if we had 14 skids to fasten to underneath the building. As a matter of fact there are actually 13 so that this result is lower by about 120 h.p.

The tremendous power which is applied to the building under these conditions is shown by the fact that the steel cable which is fastened to the blocking under the building, and connecting to the pulley, has bitten in quite deeply on a 10″ x 10″ fir timber to which it has been fastened. This is more noticeable on the two outside blocks where the tension on the cables is the greatest. The best quality of Blue-Line steel cable has been used to connect between the pulleys and the skids under the building, and Mr. Laplant, the owner, highly recommends it.

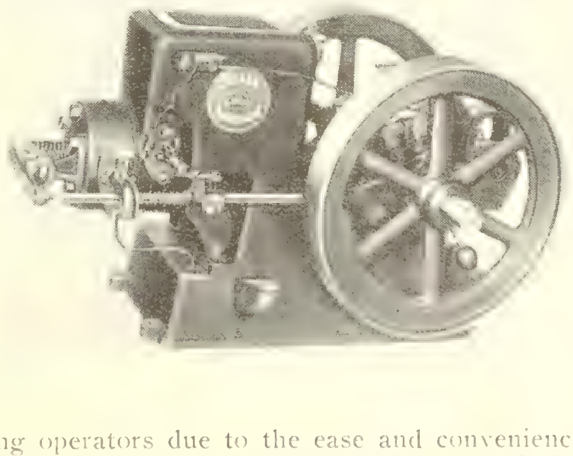
The above information was obtained by our Montreal correspondent from Mr. E. N. LaPlant president of the LaPlant-Choate Mfg. Company, Cedar Rapids, Iowa, U. S. A., who were the contractors for the moving of the building.

The photographs were taken by Mr. Boyd of the staff of the Forest Products Laboratory to whom we are greatly indebted for the copies.

New 2½ h.p. Gasoline Engine

The Fuller & Johnson Mfg. Co., Madison, Wis., announce an addition to their line of a new 2½ h.p., model "N" gasoline engine, which is proving very popular in the construction field. This new size, as well as their entire line of model "N" engines, embody many new improvements and refinements, which have added to the durability and efficiency of their engines and at the same time to the operator's convenience.

The new filler pipe to the fuel tank as shown in the photograph has caused much favorable comment among operators due to the ease and convenience of filling the fuel tank. The double throw switch, assuring uninterrupted service, is now standard equipment with magneto ignition; and the new magneto mounting, in addition to being convenient, is high and dry, thus being away from oil and grease. The wide, heavy flywheels, the heavy crank shaft and bearings give strength and rigidity to the engine.



Estimating the Cost of Lathing, Plastering and Stucco Work

Practical Data that Will Assist the Contractor to Determine the Cost of Plastering and Allied Operations —Ornamental Work

By CHAS. F. DINGMAN, M. Am. Soc. C.E.

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Not long ago, I attended a lecture by Roger W. Babson and he was asked, "When will the wages of clerks begin to equal those paid to plasterers?" His answer, and it is the correct one, was, "When people begin to realize that it is better to be a first-class plasterer than a second-class clerk."

Until we get a great many more people to learn the plasterer's trade, plasterers will continue in much greater demand than the available supply and every building boom, or near boom, is going to see competition among builders for the plasterers that can be had. This always results in sending wages up and daily production down. As long as such conditions last, any data submitted for the purpose of estimating plastering costs must be used with a great deal of judgment and due consideration of all existing local conditions.

The same remarks apply, though probably not with equal force, to metal lathing and furring. Wood lathing, on the other hand, is usually paid for at an agreed price per 100 or 1000 laths, so the lather has a definite incentive to do a good day's work. And, if the price be known in advance, the estimator need only determine the number of laths needed and multiply it by the price to determine the labor cost of the work.

Since the laths themselves are purchased by the thousand, the following table will give all the information needed, after the area to be covered has been determined.

Kind of Lath	Nailing Centres	Lath per Sq. Yd.	Lbs. Nails per 1000 Lath	Hrs. Time per 1000 Lath
[illegible] wide 32" long	12"	26	9	4.75
1 " wide 32" long	16"	26	7	4.50
1 " wide 48" long	12"	19.5	14	5.25
[illegible] wide 48" long	16"	19.5	10	5
[illegible] wide 48" long	12"	19	14	5.25
[illegible] wide 48" long	16"	19	10	5
[illegible] wide 48" long	12"	14.5	14	5.25
[illegible] wide 48" long	16"	14.5	10	5

The time given is for skilled lathers. When lathers are not available and the lathing is done by carpenters, the time must be increased from 25% to 33⅓% depending upon the skill of the men employed.

Right here it is well to mention that trade practices in many communities affect the methods to be used in surveying quantities of lathing and plastering. For instance, in certain sections no opening less than 21 sq. ft. is deducted; in others, openings under 2 feet in width are not deducted and one-half of all wider openings is deducted. Sometimes curved work is charged at double the price of flat work. Every estimator should familiarize himself with the practices in the sections in which he works and govern himself accordingly when considering work to be sub-let or when undertaking work on a unit-price basis.

The data included in this discussion are, however, intended for the man who intends to employ the plasterers, lathers and laborers himself and wishes to estimate accordingly. He should take off actual net areas, and make the necessary additions for corners and other items, as will be explained later.

Sometimes, plaster-boards are used as an effective substitute for the lath and for the first coat of plaster. In figuring it should be remembered that the boards are made 32" x 36", so as to be suited for 12", 16" or 18" nailings and, therefore, each sheet contains only 8 sq. ft. instead of a full square yard. Thus, if you buy the boards at 24 cents each, a yard costs you 9/8 of 24 cents or 27 cents.

Table 2.—Plaster Board

Thickness	Weight per yd.	Lbs nails per yd. 12" nailing	Lbs nails per yd. 16" nailing	Sq. yds. placed per hr. 12" nailing	Sq. yds. placed per hr. 16" nailing
¼"	13.5	0.19	0.15	11	12
⅜"	18	0.20	0.16	9	10
½"	22.5	0.21	0.17	7	8

Metal Furring and Lathing

There is such a wide variety of kinds of metal-lath that it is hardly practicable to tabulate accurately the unit-time-costs of installing every kind of lath under all different conditions.

Figuring the cost of the lath itself is a simple matter, since you have only to take off your actual quantities of surfaces to cover and add the following allowances for waste.

Plain surfaces,	add 5%
Beams, pilasters, etc.,	add 10%
Cornices	add 20%
Domed and groined work	add 25%

Since you can readily obtain quotations on the kinds of lath required, you have only to multiply the quantity by the price. The labor, however, will vary with the difficulty of handling the materials. Naturally, a heavier gauge cannot be manipulated as handily as a light gauge lath, and various types of expanded lath, even of the same gauge, will vary materially in their ease of manipulation.

For all ordinary work on wood furring, the following figures may be used, and one pound of staples should be included for each twenty yards of lath.

Table 3.—Metal Lath on Wood Furring

(Hours per 100 Square Yards)

	Spacing of Studs or Furring	Hours
Flat ceilings	12"	14
Flat ceilings	16"	10
Walls and partitions	12"	12
Walls and partitions	16"	9

Simple coves	12″	24
Simple coves	16″	18
Simple cornices	12″	26
Simple cornices	16″	20
Elaborate cornices	12″	30 or more
Elaborate cornices	16″	24 or more
Beams and girders	12″	28
Beams and girders	16″	22
Panel or arched ceilings	12″	16
Panel or arched ceilings	16″	22
Groined ceilings	12″	18
Groined ceilings	16″	14

Where metal-furring is required, except in the case of "self-furring" lath, it is necessary to calculate the amount of furring material separately as it may vary from 5 pounds to the square yard in the case of comparatively simple cornice work, up to 15 pounds to the square yard in the case of heavy hung ceilings.

In doing this, be sure to take off all hangers, cross-bars and longitudinal bars and to figure their total weight by the method explained for builders' wrought-iron work, being sure to add 15% for waste in cutting, bending, etc., and extend it at the current price per pound.

The labor cost of placing the material may be calculated from Table 4.

Table 4—Metal Furring and Lathing

	Time in hours per 100 sq. yds. Placing the lath		Time in hours per 100 lbs. Metal
	16″ Spacing	12″ Spacing	Placing the furring
Simple Beams	26	20	8
Heavy Beams	30	24	9
Heavy Cornices	32	26	9
Panelled Ceilings	14	18	8
Groined Ceilings	16	20	12
Flat Ceilings	12	16	10
Partitions	11	14	3
Walls	11	14	5
Coves	20	26	8

Plastering

There is practically no limit to the number of different kinds and qualities of plaster finishes that may be obtained, each with a varying labor and material cost, and there is also a wide range of manufactured products available, each of different covering capacity and varying cost of application. Manifestly, it will be impossible to thoroughly discuss all of these finishes in this text, so we shall endeavor to treat only those which are in most general use.

Right here it may be well to add a word of caution to the estimator. It is not at all unusual to find a clause in specifications stating that the work must be done in strict accordance with all state, provincial and local regulations. In certain places, local custom provides that not less than two coats of plaster must be applied, while in one state there is a law requiring that all plastering must consist of "scratch, brown and finish coats." So, even though you can, if you have good mechanics, do a good job with only one coat on "Sackett" board, or even through the specifications require only one or two coats, you must figure upon putting on the number required by the regulations.

The man who has to estimate the cost of plastering should familiarize himself with all of the various kinds of plaster available in his market, their cost, covering capacity, workability, etc., so that he may make the most intelligent use of the information contained in this text.

In using the tables which follow, keep in mind that they include the cost of all ordinary scaffolding but when the walls are over twelve feet high, it is usual to have the carpenters build a staging, which is often left in place for the use of the painters, or decorators, later.

Be sure that your estimate takes care of such staging under the proper heading.

Table 5.—Labor Costs of Plain Plastering

(Per 100 sq. yds.)

Note. Figure an equal number of hours of laborer's time to the number of hours of plasterer's time given in each case.

Scratch Coats

	Patent Plaster	Lime Plaster	Portland Cement
On Brick	4.5	4.5	5.
On Hollow Tile	4.5	4.5	5.
On Metal Lath	5.25	5.5	6.
On Wood Lath	4.75	5.	5.5
On Ribbed Metal Lath	6.5	7.	7.5

Browning Coats

	Patent Plaster	Lime Plaster	Portland Cement
On Scratch Coat	7.	7.5	9.
On Hollow-tile	7.5	8.	9.5
On Brick	7.5	8.	9.5
On Sackett Board	7.	7.5	9.

Finishing Coats

	On Browning	On Sackett Board
White Skim	8.5	9.
Hard Finish	9.5	10.
Sanded White	10.	10.5
Floated Sand	11.	11.5
Keenes Cement	12.5	13.
Caen Stone	40.	

If the patent plaster is bought in the prepared form, requiring no further addition of sand, simply mixing it with water, a reduction of 1 hour of laborer's time may be made in any of the above figures for scratch and browning coats.

When using the table to prepare an estimate on a piece of plastering, be sure that you take the proper figures for each of the coats required and add them together to get the total labor cost.

All of the figures in the table are for an ordinary "good" job of plastering. It is possible to reduce the time required, except for scratch coats, very appreciably if a good job is not wanted but it is well to ascertain definitely what will be expected before cutting prices.

Ornamental Work

If any of the ornament required is such that it cannot be "run" in the ordinary manner, it is necesstry to secure a price from a shop having facilities for making plaster casts. These include dentils, egg and dart ornaments, wreaths, etc., etc., and must be planted onto the cornices and other members which they ornament.

An allowance of one hour of plasterer's time should be included for each three lineal feet of "planted-on" ornaments and each two square feet of panels, bas-reliefs or similar ornaments. This covers the setting only and does not include any part of the cost of modelling or casting.

In figuring the labor cost of all ordinary "run" work, such as coves, mouldings and rails, the simplest method that is at all accurate is to measure the girth of the member, including all the mouldings and figure it on the basis of the "developed" area. It should be remembered, however, that it takes as much time to run a moulding of eight inches girth as it dius of twelve inches girth, so the girth should always be figured in full feet, when fractional dimensions occur. The full length should be taken, doubling for all corners and mitres and the resultant area forms the estimating quantity.

Table 6.—Running Ornamental Plaster

(Hours per hundred square feet)

	Plaster	Keenes Cement	Portland Cement
Plasterers	30	24	18
Laborers	8	8	8

Ruling to Imitate Tiling

(Hours per hundred square feet)

	Plaster	Keenes Cement	Portland Cement	Caen Stone
Plasterers	1	1	2	10
Laborers	1/4	1/4	1	2

Bull-nosed Corners, Arrises, Etc.

For all ordinary work add 8 hrs. plasterers' time for every 100 lin. ft. corners or arrises.

Note. Portland cement finishes, whether of white or gray cement cannot be applied over any sort of gypsum undercoats. This is sometimes overlooked by specification writers and has often cost contractors appreciable sums of money because, while the finish will appear at first to be holding firmly, in a short time it will entirely separate itself from the backing.

Table 7.—Plastering Materials

(Quantities per 100 square yards)

Rough Coats. (Using wood lath)

	Yards Sand	Bbls. Lime	Bu. Hair or Fibre	Lbs. Patent Plaster	Bbls. Cement
Lime Mortar Scratch	0.625	1.5	1.5		
Patent Scratch	0.5			500	
Wood Pulp Scratch				700	
Portland Scratch	1.20	0.7	1.5		4.6
Lime Mortar Brown	0.875	1.5	1.		
Patent Brown	0.70			700	
Wood Pulp Brown				1000	
Portland Brown	1.20	0.7	1.		4.6

When metal lath is used add 25% to scratch-coat quantities.

If scratch coat is applied to brick, tile or plaster board deduct 30% from tabular quantities.

Finish Coats

	Lbs. Plaster	Bbls. Lime	Yds. Sand	Bbls. P't'l'nd Cement
Skim Finish	30	1.5		
Hard Finish	80	1.5		
Sanded White	200	0.5	0.25	
Sand Floated	200	0.5	0.25	
Keenes	300	0.5		
Caen Stone	2500			
Portland Cement		0.5	0.62	1.60

Don't forget to figure the cost of your elevator or hoist, when estimating for a multi-storey building.

Stucco

The operations involved in stucco-work are essentially the same as those involved in interior plastering and, like plastering, stucco has such a wide range of possibilities for surface treatment that it is impracticable to give complete cost data for all kinds within the limits of such a discussion as this.

The best results in stucco-work are, however, usually obtained by workmen who specialize largely in that branch of the work and who have developed a technique that enables them to produce a quality of work far beyond that of the all-round plasterer.

Besides the ordinary kinds of cement-stucco, there are numerous patent or proprietary preparations on the market and, as with plasterers, the estimator should obtain all possible data upon their use, covering capacity and workability from the manufacturers, as well as from persons who have used the preparations. It is well to remember that, while they are undoubtedly actuated by motives of the purest intent, manufacturers are likely to be very optimistic about the cost of using their products, and sometimes results in actual practice are disappointing.

When getting information as to costs of applying different proprietary preparations, it is well to ask for details as to the quantity applied in a given time-period per man, the number of coats required and it should also be noted that some of these preparations require an especially prepared base for their successful use. Costs in dollars or cents per square yard are not very helpful unless all surrounding conditions are known.

Portland cement stucco is the most common stucco in general use and it is probably the most adaptable, since it can be applied to almost any lath or masonry base, except that it can seldom be applied successfully to a concrete surface that has not been thoroughly roughened and washed.

Knowing the base to which the stucco is to be applied and the number of coats required, by the specifications, you can readily calculate the quantities of materials needed for any ordinary stucco job from Table 7.

Where the surface is to be enriched or "enlivened" by the use of pebbles or crystals, it is necessary to add the cost of those materials, which are usually sold by the 100 lbs. or by the ton by people specializing in that line.

Fine grit or crystals, allow 5 lbs. per square yard.

¼ inch pebbles, allow 20 lbs. per square yard.

Intermediate sizes require proportionate amounts.

Be sure to remember that white portland cement is much more expensive than ordinary grey cement and that white sand sometimes costs as much per bushel as ordinary sand does per yard.

The labor costs of the scratch and brown coats, as may be required, can readily be calculated from the column in Table 5, headed "Portland Cement."

Table 8, gives the data for figuring the cost of a variety of finish coats, which are to be added to the cost of the rough coats.

Table 8.—Labor cost of Stucco Finish

(Hours per 100 Square Yards)

	Plasterers	Laborers
Plain Finish	12	9
Sand Float	15	11
Coarse Pebble Dash	16	12
Fine Pebble Dash	16	12
Slap-dash	15	11
Broomed	15	11

Building in New Westminster, B.C.

According to the building inspector of New Westminster, B. C., the following building permits were issued during April:—7 new residences, $20200; 18 additions to residences, $7,740; 12 repairs to residences, $3,270; 11 private garages, $1,360; 1 addition to bakery, $1,000; 1 addition to laundry, $1,000; 2 small stores, $900; 2 chicken houses, $110. The increase over April 1922 was 63.77%.

Hints for the Contractor

Removal of Hard Concrete From Mixer

Editor, Contract Record;

Can you suggest any method for removing concrete that has hardened in a mixer. I loaned my ¾ yard mixer last autumn after I had finished with it and the borrower left several pails of concrete in it. Now when I want to use my mixer this concrete is as hard as a stone. How can it be cleaned out?

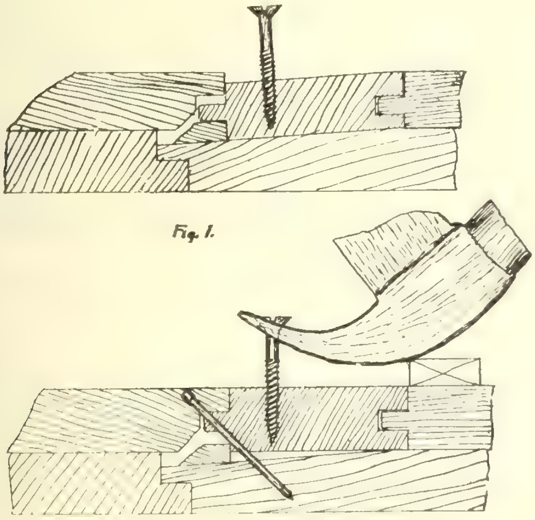
Yours truly,

Unfortunately there is no known substance that will dissolve or soften concrete. We have heard of heat being applied under similar conditions, the idea doubtless being to create a pocket between the metal wall of the mixer and the concrete so that the adhesion would be lessened. The mixer was then hammered from the outside but the result was not very satisfactory. There seems to be no royal road to the solution of this problem, the only sane solution being the chisel and mallet.

Will any contractor offer any further suggestions out of his experience?

A Floor Fixing Kink

The carpenter is frequently called upon to repair floors, which have an end of a board or an edge of a board sunken down below the surface. This is probably caused by defective material, careless workmanship, or by moving heavy furniture over the floor. Whatever the cause, the thing that the man who is called upon to fix the floor is concerned about is how to get it back into place with the least expenditure of time and material. For, ordinarily speaking, the layman thinks that a little thing like that can be done in a few minutes. Of course, he himself couldn't do it, but a carpenter can—if the carpenter can't there is surely something wrong with him. That is the conclusion that many householders come to, and at such times they feel that they are being imposed upon by unmerciful mechanics. In some instances they are right, but not always.



How to raise broken floor board

As a rule the defects mentioned above can be remedied in such a short time that the owner will be so well pleased that he will go to his neighbors and friends, telling them that the man who did the work was the best mechanic in the community. Thus writes H. H. Siegele in the "American Builder" and here is the way it is done: Drill a hole into the board, and insert a wood-screw—see Fig. 1. Then take a claw-hammer or claw-bar and a block of wood (Fig. 2) and lift the board up. Next drill holes for the nails about four inches apart, as shown in Fig. 2—and with another hammer drive the nails in and set them; 6 or 8 penny finish nails will give the best results. If one lift will not bring all of the sunken board to the surface, nail what is up and then change the screw and lift again. Repeat this until the job is done.

A Question for Our Readers

Editor, Contract Record:

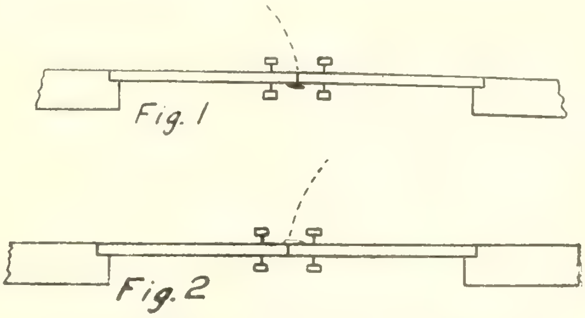
I had quite a discussion with the boss the other day about the right way to hang the French doors between the dining room and parlor in a house we are building. He insisted that I hang them as in Fig. 1, while I maintain that Fig. 2, shows the right method.

I would like to have the opinion of other carpenters and readers.

My argument is that the door 'stop' has a twofold purpose (1) to hold the other door closed and (2) to keep out wind and weather. The arrangement in Fig. 2 is plainly better for outside doors. Why should it be changed for inside doors?

Yours truly

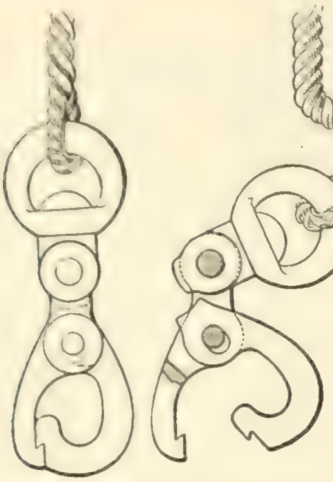
J. B. Sharples.



How should the bead or centre strap be fastened on?

Hoisting Accidents Prevented by Safety Hook

To insure safety in hoisting heavy loads with cranes or derricks on construction work a hook equipped with a locking device has been developed by the Yankee Safety Appliances Co., New York City. It is an adaptation of a device designed for detaching lifeboats from ships at sea. The locking principle of the hook is illustrated in the accompanying drawings. It cannot be attached to a load unless it is locked in position and cannot be unlocked until the load is safely landed and the hoisting line slack. The drawing at the left shows the hook locked and in position to carry a load; the one at the right indicates how the hook may be unlatched when the tension on the hoisting rope is released.


Hook that remains locked while carrying loads

These hooks are made in five sizes with capacities respectively of 2, 5, 10, 15, and 25 tons. On the two larger sizes a handle is provided to facilitate the unlatching of the safety device. The bearing pins are of Monel metal. If desired, a ball-bearing swivel can be provided for the 20- and 25-ton sizes.

New Books

Engineering of Excavation, by George B. Massey —This book, which has been written as a result of the author's wide experience in the study and practical application of machinery to excavating problems in all parts of the world, contains several special features which make it of undoubted practical value to every engineer or contractor whose work takes him into the field of excavation. A very large percentage of the text matter consists of the author's original notes and information obtained first hand in the field, under actual working conditions. Present-day excavation methods and machinery are thoroughly described, supplemented by clearly reproduced half-tone illustrations and line diagrams. No prices are stated, but simply quality and quantity of labor and materials. Throughout the book, short, concise and useful tables are included, giving reliable information pertaining to sizes and capacities of steam shovels and buckets, records of work done, blasting of ditches, quantity and pressure of water for hydraulic excavating, cubic yards excavated per hour by hydraulic dredges, rate of stripping with various machines, etc. The use of this book facilitates the proper choice of the type and size of machine which will do the work contemplated better and more cheaply than any other. The chapter headings are as follows: Large Revolving Shovels; Standard Shovels; Small Shovels; the Dragline Excavator; Tower Excavator; Dry-land Excavators; Trench-digging Machines; Buckets; Transportation; Hydraulicking; Drilling and Blasting; Hydraulic Dredges; Dipper Dredges; Bucket Dredges; Clamshell Dredges; Scows and Barges; Dredge Hulls—Computation; Dredge Hulls—Construction; Boilers, Fuel, Electric Drive, Wire Rope; Application of Machinery to Work. The book contains 376 pages, is priced at $6.00, and is published by John Wiley & Sons, Inc., New York City.

New Building Estimators' Handbook, by Wm. Arthur—The latest edition of this standard work contains 1,002 pages, replete with almost every conceivable kind of information that will assist the building estimator. In order to keep the contents of the book within reasonable bounds, the text has been made as concise as possible, consistent with a clear treatment of the subject. The subject matter is very comprehensive, treating of every phase of building work. In almost all cases, the time required to instal materials is given and where the cost alone is set forth, the rate of wages is specified so that detailed figures to suit any period, place or rate of wages can be obtained. Besides the ordinary mathematical tables, so useful for every-day reference in a book of this sort, there have been added some special tables that will facilitate the calculation of building quantities, such as a series of tables for estimating plastering, etc. The chapter headings are as follows: Measurements of Building Work; the Quantity System of Measuring; Speed and How Affected by (1) Climate, (2) Hand vs. Machine Labor; Excavation and Filling; Piling and Underpinning; Concrete Work; Reinforced Concrete; Stone, Gravel, Marble and Terra Cotta; Brickwork; Cement Stone; Structural Iron and Steel; Tile and Gypsum Fireproofing; Steel Sash and Steel Buildings; Plaster; Carpenter and Joiner Work; Millwork; Glass; Roofing; Sheet Metal Work; Hardware; Painting; Plumbing and Gasfitting; Heating; Electric and Conduit Work; Tiling; Asbestos Materials; Dairy Barns; Silos and Tanks; Municipal Work; Weights and Measures. The book is published by the U. P. C. Book Company, Inc., New York City.

Trade Publications

"Little Tugger" Hoists—The Canadian Ingersoll-Rand Co. Ltd., Montreal, in a new bulletin describe the 6-H "Little Tugger" Hoist which has a wide range of usefulness in mining, quarrying, contracting, handling clay and gravel or excavation work. Special reference is made to the use of these hoists with scrapers in "slushing" operations.

Pneumatic Tie-Tamping Outfits—In bulletin 9223 the Canadian Ingersoll-Rand Co. Ltd., Montreal, describe and illustrate the use of pneumatic tools for track operations. These appliances, which have been used by both steam and electric railways, are adaptable for a variety of uses. The bulletin also describes compressor outfits suitable for feeding pneumatic track tools.

What the Engineer Can Do in City Planning

The Problems Involved in Community Development and the Engineer's Relation to Them—Paper Read Before the American Society of Civil Engineers

By GEO. H. NORTON

It has long been accepted that the engineer is essential to the planning of certain phases of community development. For sewerage, drainage, and water supply, his services have been indispensable, even from the earliest developments. As a surveyor he has had influence, at times, in the laying of the general plan of highways, which has directed the future development of a city street system. His position has been essentially that of a hired man assigned for specific purposes, with little differentiation between his highest professional skill and his ability as a surveyor.

The Government surveyed areas, the rectangular system has imposed enduring hardships on many cities, ameliorated, in some fortunate circumstances, by the imposition of diagonals where topographic conditions had induced the aborigines to establish reasonable trails, later followed by the pack train and the pioneer wagon, until they were so well established as highways as to maintain their integrity. In some of the older eastern cities, devoid of dominating topographic conditions, too often this casual development, through trail and road to street, has been without control by features warranting the devious street plan for a modern city. However, there are excellent examples of sound judgment and foresight in the original plans of some cities. Perhaps, today, there is not a proper appreciation of the skill and courage of those who more than a century ago went into the practical wilderness and prepared the ground plans of cities, which have reasonably sufficed until such cities have grown in size far beyond that of any city existing on the American continent at the time of the original plotting.

Engineers Must Meet Modern Planning Problem

Having in mind this unfortunate past condition, it is encumbent upon the profession to review the situation and meet the modern planning problem as it has met others.

Large numbers of the older generation of engineers have been associated at some time, and in some way, with railroad location, construction, or subsequent operation. They developed a high engineering conception of the problems involved and created standards which may guide. Much of this development came after, or perhaps more properly, was the larger element in creating literature and associations for the dissemination and discussion of the problems involved. When these, or other engineers have entered municipal service, their immediate and pressing duties have been the providing of sewerage, drainage, water supply, and pavements suitable for the existing areas and, perhaps, to look forward to the provision of such for adjacent territory. Assistance is seldom provided beyond that necessary to meet pressing demands, and more seldom is it realized that the field of the engineer should be wider.

The growing sentiment of a few decades ago, that American cities as municipal machines were not at par with other American achievements, led the ever-present reformers to demand changes in organization and administration. After having run the gamut of charters and methods to find that they do not change human nature, there has been a sudden awakening to the fact that municipal structures have simply grown from the demands of commerce, industry, and transportation along lines dictated by the especial needs or convenience of each and without thought of the mutual relations between them. They have grown under the stimulus of varied business impulses, not always harmonious in needs, and without definite plan or guidance. This realization apparently came first, not to the engineer, but rather to the artist and the architect who sensed the lack of harmonious development and the unnecessary clash and ugliness of many elements. Hence, it was only natural that the earlier movements in city planning were along the line of the "City Beautiful."

Most Necessary Things for Well Ordered City

The general awakening has disclosed the most necessary things for a well ordered city to be definite kowledge of its actual physical condition and a definite plan for its future development. The ills of the municipal body lie in its deformed and unguided growth rather than in its charter or ordinances, and its beautification should be in ordered arrangement and growth more than in surface embellishments. These fundamentals are fairly well accepted today, but the details of development are without accepted standards.

The complex problems of arrangement and coordination of the varied and often conflicting interests are so great as to demand the united wisdom of those versed in all their phases. There has been developed, therefore, the usual form of planning commissions composed of representative citizens whose united intelligence should cover the wide field, and to their assistance has been brought available engineering or other professional advice. Where such technical advisers have not been over-shadowed by the so-called practical element, scope for excellent results has been given, the balance of judgment of those representing the complicated interests formulating a policy which would give reasonable results when technically applied.

The Engineer as Dominating Factor in Development of Plan

The alternative method of approach in making the engineer the dominating factor in the development of a plan with the representatives of varied interests acting as advisers has had less general application. Results alone can determine the relative advantages and much will depend on the wisdom and judgment of the engineer. He must have the support of the profession not only in sympathy, but more in the development of standards of this comparatively new field. This can be done only through discussion in engineering bodies and dissemination through the technical press.

Although the formulation of a definite plan for the judicious and orderly development of a city may have the highest talent and devotion in its preparation, such a plan will avail but little, unless it can be established.

The successful engineer has had his experience in presenting plans to the chief executive. Usually, the plans have been authorized by the directors who feel assured of the backing of the stockholders. The only questions for consideration are the fitness of the plan and the financial elements. In a city plan, however, there is the element of broad practical politics, not of the partisan kind, but in the truest sense. Municipal governments are most highly representative. The elected representatives in whom the ultimate authority lies may be ever so broad-minded and ready to assist in the development of a plan, but they cannot carry out any comprehensive one unless it is the will of a decided majority of their constituency.

The Threefold Problem of the Engineer

The problem before the engineer entrusted with any planning project is, therefore, threefold: To prepare a plan which has features such as to appeal to the sound judgment of a large part of the citizens; to co-operate with the ever-present public-spirited citizens who are ready to assist in laying the matter fully before the whole electorate in such a manner as to win their approval; and with such public approval, to go before the constituted authorities with the plan and a reasonable program of execution that the legislative and executive authorities may adopt and place under execution the most essential features. With the plan thus established in the minds of the people, there should be no reasonable fear that it, as a whole, will perish. Any live city has enough citizens of public spirit and foresight to see that the matter is brought to successive administrations, with public approval assured.

It is feared that some worthy plans made possible by the endeavour of the few, without general public aceptance, through publicity, may fail of achieving the early results which their intrinsic merit really warrants. Having in mind the essentials to the success of any city plan, the engineer interested in such is brought squarely to face the modern conception of his profession. He must realize that his function is not merely that of the trained investigator and establisher of fundamental facts, but rather that it has the wider limits of the human element. Assured in his own conclusions, he must be able to lay the reasons for such before the public in a manner to show their soundness and be able and willing to meet all objections with the convincing facts at his disposal.

Many Phases Adapted to Engineering Analysis

The phases of city planning particularly adapted to engineering analysis are many. The first step in any general plan may be designated as reconnaissance, or the broad survey of the resources and probable line of development of the city and its environs. Such a survey is necessary to the formulation of any comprehensive plan. The whole range of transit and transportation facilities, terminals, harbor development, and many other such questions will intrude themselves into any broad study, and, even if not directly included in the designation, must be given weight.

Today, the most pressing demand for immediate consideration is apt to be for improvement of streets and the street plan to accommodate the traffic of motor vehicles. The civil engineers of a previous generation developed the lines of transportation by the construction of railroads along carefully surveyed routes. Today, although 1,000,000 freight cars may be loaded each week to pass over these lines, 10,000,000 motor vehicles are daily passing over streets and roads that were mostly laid out and determined before the construction of an automobile. There has been developed an entirely new mode of conveyance fitted for travel on highways which were laid out for other vehicles. The flexibility and adaptability of these modern vehicles is such that they may use the rural highways and many urban streets if only a reasonably hard and smooth surface is provided. Such a condition has forced on the whole country a road-building and paving industry and has developed new engineering standards in paving design. Except in the territory adjacent to large cities and on main connecting thoroughfares, the roadway wide enough for vehicles to pass safely provides accommodation for its traffic. Within the cities and on their converging highways, however, the newly developed transportation has been imposed on a street plan not designed for such purpose and bounded and limited by costly land and improvements which make difficult any material alterations. This condition now imposes on the engineer the more serious problem, not to design a thoroughfare system for specific needs, but to adapt the existing facilities to pesent demands so as to require a minimum of expansive changes.

It is not intended to enter into a discussion of the problems of street design, but rather to outline a few of them as typical of the engineering phases of city planning. No standard, as yet, may be considered established and cannot be until it is perfected through experience and analysis.

Widening Main Thoroughfares vs. Providing Parallels

Most direct thoroughfares in cities have been occupied by surface traction lines with consequent business development.The location is such as to invite motor traffic with consequent congestion. Although surface traction cars interfere with the easy operation of thousands of motor cars, the latter delay thousands of passengers on the former. Diversion of traffic from such streets may be considered detrimental to the developed business interests. The cost of widening by land acquisition would generally be excessive.

Should these thoroughfares be widened or should parallels be developed to divide traffic?

Will such diversion injure adjacent business or endanger residence property on the parallels?

If such parallels for vehicular traffic are provided, should they preferably be immediately adjacent to developed main traveled streets or should they be intermediate between such?

Many cities have abolished at large expense railroad crossings at grade. Today, at intersections of heavy-traffic streets, more accidents occur and more delays to traffic.

Are we to look forward to grade separation at such important points?

Where we continue to operate at grade, must we continue the alternate "stop-and-go" system or can the rotary, continuous system be developed with reasonable land acquisition?

Can the rotary continuous plan be adopted in preference to the reservoir system for holding the waiting vehicles.

In design of a rotary intersection requiring a material slowing down of traffic, can safety elements be introduced by the modification of grades or vertical irregularities?

Must separate provision be made for passage of long fire apparatus?

Vehicles and the Pedestrian

What relative weights should be given pedestrian traffic and vehicular traffic when in conflict?

What is the effect on pedestrian traffic of long-radius intersection corners?

Is there a practical limit to the widths of pavements due to difficulty of maintaining parallel traffic lines and danger to pedestrians?

Are two parallel roadways preferable to single one of their combined width?

Are diagonals as essential to motor-vehicle traffic as they were formerly thought to be for mixed traffic?

Are not the complicated diagonal crossings often as much of a detriment to traffic as the longer routes of a rectangular system?

Do the advantages of radiating diagonals outweigh their tendency to traffic concentration?

These random problems arising in one phase of city planning are herein noted as illustrative of the character of those details which demand engineering solution. Today, engineers are becoming alive to them and will solve them as they have solved others.

When the engineer is brought face to face with city planning, he must not only be able to master the technical details, as he has in other lines, but he must realize in the broader way that he serves, not a definite executive, but a complex public. He must have the wider vision clearly before himself and, with it, the courage and ability to impress these visions on the public. The line of reasoning with which he reaches conclusions must be so clear that it appeals to the average citizen. No plan may stand this test unless it is based on sound engineering fundamentals. No plan can come to execution unless it is understood and appreciated by the public. No plan can die which has been accepted by the citizens as sound and practicable.

The enginer who enters on city planning must realize that his work is not confined to office detail, but that he must enter that broader field of the man among men. No other field today offers a fairer range for the highest development of engineering perspective or the formulation of new standards, and certainly none promises a fuller opportunity for the engineer to take his place as a leader of public thought, qualified to guide the development of those greatest institutions, the cities.

Using Local Materials for Road Building

Broken Stone, Gravel and Sand are Local Products Which, if Satisfactory, Should be Developed—Other Materials are Often Available —Making Use of Old Roads

By VERNON M. PIERCE*

The principal materials used in highway construction other than strictly manufactured products are broken stone, gravel and sand. Almost every type of highway which has been devised may be made to utilize one or more of these products for the greater part of the pavement. However, the material should meet certain rather definite requirements for the various types of construction. The problem, therefore, presents itself of selecting a type of construction which will utilize to the best advantage the characteristics of the particular local material which is most available. By this it is not meant that suitability of type should in any case be sacrificed in order to use local material, for in most cases it will be found that if all prejudices are cast aside some type and design of highway may be found which will utilize a considerable proportion of local material and at the same time will prove adequate to meet local conditions of traffic, climate, etc.

Local rock, with comparatively few exceptions, will prove satisfactory for at least some portion of the highway. Frequently, however, broken stone is imported from a considerable distance either because the local product is not well suited for the type of construction selected or because no crushing and screening plant is operating in the vicinity of the work. In the former case a different type of construction equally well suited to meet local needs may be the solution and in the latter, encouragement to contractors to open up the local deposits and if necessary to operate with portable equipment. In general, rock of a slaty or schistose structure and friable rock of a purely siliceous nature are not adaptable for highway work. Almost all other types from the hard, dense trap to the soft, coralline rock will prove serviceable when properly used.

Stone for Macadam Work

When the waterbound or surface-treated macadam is a sufficiently high type to adopt, the gneisses, sandstones, quartzites and the very soft limestones should be used only in the foundation course, the first three because of their lack of cementing value and the limestone because of its poor wearing qualities. When such rocks are the only available local material, however, they may be used in the constuction of a bituminous macadam wearing course at a cost frequently less than would be incurred by importing a rock suitable for waterbound construction. Thus a higher type of construction would be secured with either a saving or no additional expense. The bituminous macadam is also well adapted for utilization of rock which is not sufficiently tough or wear-resistant to be used either in bituminous concrete or Portland cement concrete pavements. Many of the sandstones fall in this class. The very soft coralline rock is unsuitable for any type of wearing course except bituminous macadam, although it makes an excellent foundation.

Many rocks unsuited for use in most wearing courses may be perfectly satisfactory for foundations of the waterbound, bituminous macadam, bituminous concrete or other types of pavements. Where so used the selection of a wearing course constructed with some other material than rock may be advisable. Thus if a suitable grade of sand is locally available a sheet asphalt wearing course may be selected or perhaps brick from some nearby plant may be used to advantage.

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*Before the American Road Builders' Association

Local gravel is a material which may often be used for foundation purposes with economy and satisfaction in direct competition with local rock and in certain sections of the country, it is the only available coarse aggregate product. Clayey gravels are perhaps the most unsatisfactory for use except in the waterbound or surface treated types of construction. A clayey gravel may, however, frequently be washed at a relatively low cost so as to make it suitable for the construction of concrete foundations. The sandy gravels make excellent coarse aggregate for both Portland cement concrete and asphaltic concrete bases and if composed of hard, durable pebbles are well adapted for the coarse graded aggregate type of bituminous concrete wearing course. In fact, such a wearing course may be made to successfully utilize a wider range of local material than any other high type of construction.

The Uses of Sand

Sand serves as a fine aggregate material for both hydraulic cement concrete and bituminous concrete foundations and pavements, and as a cushion course for brick and stone block pavements. There are, however, only two types of wearing course in which it constitutes the bulk of the structure. These are the sheet asphalt and fine graded aggregate asphaltic concrete pavements. Sands containing a high percentage of clay or mica are unsuited for highway use except perhaps in the treatment of subgrades or the construction of sand clay roads. A high percentage of organic matter also renders them unfit for use in Portland cement concrete, but not for hot bituminous mixtures, as the organic matter is burned out when the material passes hrough the drier. Fortunately, however, in localities where sand is abundant a careful survey of existing deposits will usually develop the fact that a product of almost any desired grading is obtainable. Concrete sands, which are relatively coarse and not subject to narrow grading limitations, are in general more readily obtainable than are sands for asphalt construction which require a rather fine, carefully graded product that must at the same time be practically free from particles which will pass a 200 mesh sieve. For the latter purpose, however, local material may frequently be found which can be satisfactorily used even if by itself it would be unsuitable. Thus, proper admixture of two or more local sands will often produce a desired grading which no single deposit will meet.

In a sand and gravel country when a high type of construction may be demanded and the gravel is of inferior quality for use in the wearing course, an excellent combination may often be secured by laying a gravel concrete foundation with a sheet asphalt wearing course, thus using available local material to the best possible advantage without sacrificing the quality of the finished pavement.

There are some localities where sand is the only available local road material, notwithstanding which it may be quite practical to economically construct a high class highway. A solution of this problem has been secured in the following manner by the construction of a hot mix asphalt sand road in the vicinity of Wilmington, North Carolina. First a survey was made of sand deposits in the vicinity of the proposed road and a product selected which most closely approximated a sheet asphalt sand grading. A portable asphalt plant was then eected at the deposit for preparing the mix. The roadway was graded in the usual manner. Two by eight inch cypress stringers were firmly staked along the sides as forms and were left in place to protect the edge of the road under traffic and to keep the foundation confined. The subgrade was thoroughly compacted and upon it was then placed a foundation course 3 in. thick after compaction of a mixture of sand with about 7½ per cent. of asphalt cement of approximately 45 penetration. Upon this base a surface or wearing course having a compacted thickness of 1½ in. was then laid, which course was composed of sand, mineral filler and asphalt cement in such proportions as to approximate a standard sheet asphalt surface mixture. In this vicinity and under favorable conditions such a road can be constructed at less than $1.25 per square yard and answers the problem of a low cost road in an undeveloped section where hard surfaced roads are necessary for the development of the country.

Marl when locally available makes a most excellent foundation for a hard surface wearing course.

Using Industrial Wastes

In addition to natural deposits of available local road material, there are in many sections of the country considerable quantities of waste or by-products from industries which may be successfully used in road building with a large saving in comparison with other products, either of local origin or which would have to be transported for considerable distances. Among such materials may be mentioned mine tailings, chats and slag. Mine tailings when crushed and screened to proper sizes may be used instead of broken stone in nearly all types of highways. Chats make an excellent grit product for fine graded aggregate asphaltic concrete. Slag may be successfully used in the construction of various types of wearing surfaces. In addition to the products previously discussed, mention may also be made of shells, cinders, waste from clay product plants, straw and ashes.

No discussion of the utilization of local material for highway construction would be complete without mention of existing roads which have outlived their period of usefulness. In most cases the bulk of the material remaining in such roads may be utilized in the construction of new roads as a part at least of the foundation for a new and frequently different type of wearing course. Indeed it is seldom necessary to remove and replace with some other product the material already on the road. Every year millions of tons of such material, which, in the strictest sense, is local, becomes available for use in highway improvements. This is true irrespective of the type of the old road provided it has not been allowed to deteriorate to too great an extent, and the further utilization of such material whenever practicable becomes a matter of primary importance not only to the conscientious engineer but to the tax paying public. It is believed that many million dollars worth of old local material from such sources should be utilized each year in the general highway program.

How Much Time is Lost in Delays in Highway Construction?

Investigations Show that a Large Percentage of Possible Working Time is Lost Through Delays of Some Sort—What Constitutes Standard Performance in the Laying of Concrete Road

By H. K. DAVIS
Before the American Road Builders' Association

In the State of Iowa during the past two years some studies have been undertaken to determine what is average production on the standard types of construction equipment on highway work. On excavation and embankment work in that state the wheeler and slip-scraper are practically obsolete and no longer appear on the job except for very special purposes such as sand cuts or constricted spaces. The same is true of the fresno except for borrow pits or side hill location. Steam shovels are seldom used except in connection with rock work, and in Iowa this is a small percentage of the whole. The result has been to limit the investigation of average output to the elevating grader so far as dirt work goes.

On pavement construction the mileage of all types other than concrete has been so small during these two years that figures made on these jobs would be of very little value for purposes of comparison. The studies on paving, therefore, were confined to concrete.

On the earthwork studies, while some valuable data were collected on averages, not enough information was at hand to enable us to account for all lost time. It is therefore with the lost time on concrete pavement construction that this paper will deal.

The figures here submitted deal with 151 miles of concrete placed in 1921 and 101 miles laid in 1922, not a large program in either year. The merit of the data, therefore, lies not in its mass but in the fact that it was complete and covered average conditions over the area studied, also that it covers the work done during the two years and not a few particular jobs which might be selected to verify a pre-conceived theory.

Working Conditions

In 1921 the season so far as working conditions were concerned was about what could usually be expected:

1. Weather conditions were about what can usually be expected. The spring opened early and work started but much time was lost immediately by late snows and rains. Mid-summer weather was good but one extended spell of rain in the fall lost some three weeks of time for all contractors then at work. Winter held off a little later than usual.
2. The labor supply was good and dependable.
3. Shipping facilities were more normal than any time since pre-war days, and caused no delays that are of record.
4. A supply of material adequate to the needs either existed or was developed for the occasion. On only one or two jobs were they delayed for lack of materials to an extent that was noticeable.
5. The work was well distributed over the entire State. Therefore, conclusions drawn from these figures are not limited to a small area where conditions might be very special.
6. The work was well distributed as to size of jobs. No one contractor secured any large block of work in any one location.

In 1921 the work was carried on on 31 contracts by 19 contractors, using 29 outfits on 35 separate sections of road in 17 different counties.

In 1922 the work was carried on on 20 contracts by 13 contractors, using 19 outfits on 24 separate sections of road in 10 different counties.

The term "outfit" is here used to include all loading, mixing and hauling equipment and their crews which were operated as a single construction unit.

In 1922 the working conditions could hardly be called average in certain respects: The weather was a little better than is usual in Iowa. There were no long rainy spells. In addition winter held off for nearly a month longer than can be depended on as a rule, thus enabling several contractors to finish their work when otherwise they would have had to shut down. In all other respects the conditions were as favorable as in 1921 except as regards railway facilities. Because of the coal and shopmen's strikes many outfits were laid up for long periods waiting for delivery of materials when these same were plentiful at the producing plants.

In all respects except these latter two the conditions under which these two years' work was done are considered about average for the Middle West, and there may be a lingering suspicion in the minds of some of us that a state of business stagnation caused by labor strikes is coming to be more nearly the normal than the abnormal condition.

Sources of Information

The figures here summarized were compiled from daily inspection reports sent to the general office of the Highway Commission by the inspectors on the jobs for each day that the job was under way regardless of whether any work was done. These reports give the information usually contained in such reports as to feet run per day, cubic yards, cement content, etc., but in addition show the amount of lost time and the reason for such delay, from the start to the finish of every job. The information contained in these reports was tabulated by heading a column for each construction outfit with a brief description of the work and the equipment, and following down the column with the feet laid for each day, entering on the same line the reason for any delay that occurred on that day. The runs for a given date show opposite to each other on the same line for the entire state. Delays of less than about 45 minutes are disregarded, they being considered as a part of the day's work and too small to influence materially the day's run. The runs are given in linear feet since in the great majority of cases the pavement is 18 feet wide and of a uniform depth of 8 inches. A very simple conversion factor is furnished by the fact that one linear foot of 18 foot pavement represents two square yards of surface.

Incidentally it may be stated that this method of tabulation has the merit of permitting rapid comparison between all the outfits concerned for any given day or period of time. A state-wide rain shows up plainly on the progress made throughout the entire state on that date. Also it shows up in a rather startling manner the power of recovery of the various outfits after such a rain. Those organizations that are well-known for their pep almost invariably stage a quicker comeback than the easy-going ones. When two outfits work side by side and conditions are similar and the weather the same, and one outfit fails to work more than about half the time while the other produces steady results day after day, the natural conclusion is that the difference lies in the kind of management brought to the work by the contractor.

Another point frequently claimed but not as yet proved by the Iowa data is that an industrial railway haulage outfit can be run more days in the season than a truck-haul outfit when the two are operated under the same or equally good management.

..Length of Construction Season

In 1921 the first concrete laid was on April 8; the last on November 16th. This covers an interval of 223 calendar days, which has been taken as the length of the construction season for the most venturesome contractor. In 1922 the first concrete was laid on April 27th; the last on November 29th. This made a construction season for 1922 of 217 calendar days. Both of these seasons are considered to have extended a little later into the fall than can regularly be counted on, though only the 1922 season included a greater number of suitable work days than the average.

In the construction season of 1921 the 29 outfits laid on an average of 27,525 linear feet of pavement each or about 5.25 miles. In 1922 the 19 outfits averaged 28,021 feet each or 5.30 miles.

In fairness to the contractors on the work it must be stated that this average output for a long season's work is not representative of their producing capacity. This is clearly shown by the fact that several outfits have turned out from 10 to 15 miles in a single season. It is explained by the fact that under existing highway laws Iowa is frequently compelled by the financial situation of the counties to let pavement contracts in units smaller than what would constitute an economical length of run for an outfit for the season.

Average Performances

The average length of season per outfit required by the contractors in 1921 to complete their undertakings was 114.3 calendar days, indicating a reduction of nearly 50 per cent. from the possible total of 223 As intimated, this reduction is chargeable to the conditions under which the work was let rather than to any unwillingness or inability on the part of the contractors to carry on for a full construction season. In 1922 the average duration of time on the work was 100.8 calendar days or considerably more than a 50 per cent. reduction from the possible 217 calender days. In any case where a contractor was able to finish his season's work within the construction season it is difficult to see how he can in fairness be charged with the failure to work through an entire season. The findings are reversed when, because of lack of foresight or good management, he fails to make use of all the available time in starting his work in the spring or in running late in the fall and as a result fails to finish.

In 1921 the average output per calendar day was 241 linear feet. This shows how small a figure should be used in case it is ever desirable to use calendar days as a basis for figuring. In 1922, however, the average per calendar day was raised to 278 linear feet.

Average Run

When Sundays and legal holidays are eliminated from the total calendar days in the season a more logical basis for comparison results. In 1921 with the Sundays and holidays eliminated there remained 96.1 possible working days on the average. The resulting run figured on this basis was 286 linear feet. In 1922 the possible working days averaged 85.7 and the run per day 327.6 linear feet. These runs reduce to about 60 square yards per possible working day as an average for the two years.

Eliminating all rainy days and other stops of an entire day leaves 74.1 days per outfit on which concrete was actually laid during the season of 1921. By the same process the days actually worked during 1922 reduces to 61.2, and not all these days were full days since many of them show only short runs when rain, breakdowns, etc., stopped the work for the remainder of the day. It came as a distinct surprise to most engineers and contractors in Iowa to find that all the concrete pavement laid in 1921 could have been placed in 2.5 months of straight time, and the entire 1922 program in two months, if only the numerous delays could have been eliminated. Yet the work occupied the time of all the contractors and all the engineers for most of the year.

The average laid per day worked also seems like a very conservative figure. In 1921 it was 371.5 linear feet. In 1922 it rose to 457. This increase is very probably accounted for in part by better management and increased efficiency. But another factor is present which is known to be responsible for the major part of it. This is the increase on the average size of the plant equipment. During 1921 the largest outfit on the work was equipped with a 21-E paving mixer or a plant mixer of equivalent capacity, while there were several smaller than this. In 1922, there was only one mixer smaller than a 21E and several large outfits came onto the work with mixers as large as a two cubic yard capacity.

The figures here obtained, if conclusive, indicate that 800 square yards of 8 inch concrete is a safe estimate of the daily capacity of a paving outfit on the average, unless the size of mixers is increased, efficiency raised materially, or some method is found of beating the weather.

The 74.1 average of days on which work was done represents 64.8 per cent of the 114.1 average calendar days in the season of 1921. In 1922 the 61.2 average days worked is 60.7 per cent of the 100.8 average calendar days. The writer recalls having asked one contractor's superintendent what in his judgment was the per cent of time a man might safely count on as available in a construction season. After some thought he gave it as his opinion that 80 per cent was the most that anyone could rely on. To verify his statement his outfit in 1921 came within 1.8 per cent of reaching the 80 per cent he had himself set as a mark. The nearest competitors his firm has had on the Iowa work in two years have not yet passed 74 per cent in days worked out of days spent on the job. Very few have passed 70 per cent and many are around 50.

Classification of Major Delays

The days not worked were classified under various heads according to the causes for such delay. The per cent of the total calendar days thus lost was as follows:

	Percent	
	1921	1922
Lost on account of Sundays and holidays	14.20	13.67
Lost on account of snow, rain, mud & frost	14.70	9.72
Lost on account of breakdown of equipment	1.09	.47
Lost on account of shortage of material	1.14	9.83
Lost on account of moving equipment	2.56	2.56
Lost on account of all other causes	1.51	3.02
Totals	35.20	39.27

Attention is invited to the fact that a greater proportion of days were lost in 1922 than in 1921. Also to the fact that delays due to causes within the control of the men on the job average about the same for the two years.

Those delays least subject to elimination by the contractor are the ones in which the widest variation shows between the two years. For example, the weather was more favorable in 1922 and contractors lost 4 per cent less of their entire time from this cause than in 1921. On the other hand, the railroad situation in 1922 caused shortages of material which delayed the contractors nearly 9 times as much as in 1921, and caused them to lose 8.7 per cent more of their total days. This quickly ate up all time saved on all other causes and left them behind as much as they otherwise might have been ahead.

Sundays and holidays and weather, as might be expected, make the largest draft on the contractor's available time. Break-downs that cause a whole day's delay are rather noticeable by their absence. Apparently most up-to-date contractors have solved the problem of providing against delays of this sort by having on hand a stock of repair parts and a good live man to see that they are used. Moving and re-erecting of equipment seems to take up a larger amount of time than most of us would suppose.

"All other causes" for days lost include shortage of water, shut-downs to do grading work, shut-downs by the engineer or inspector to correct defective work, shortages of labor, strikes, etc. They are each one so small as not to justify separate classification.

The fractional days lost are classified under the same headings as the whole days with the exception of Sundays and holidays.

	Percent	
	1921	1922
Lost on account of snow, rain, mud and frost	12.41	10.31
Lost on account of breakdowns of equipment	5.21	5.24
Lost on account of shortages of material	2.51	3.35
Lost on account of moving equipment	1.58	3.78
Lost on account of all other causes	4.55	6.70
Totals	26.26	29.38

These totals of 26.26 and 29.38 represent the percentage of days worked on which some considerable delay occurred due to some cause or other. The average of actual days was 19.55 for 1921 and 18 for 1922. Subtracting these from days actually worked leaves 54.7 days for 1921 and 43.2 for 1922 as the total number of full days worked on the average by all the outfits in the state. On all the other days worked occurred some considerable delay that prevented them getting in a full day.

Standards of Performance

In an article appearing in the Engineering News Record in May, 1922, the following paragraph appeared. It is repeated here as expressing the sentiments of the writer on this matter:—

"The almost universal habit of engineers to give honorable mention only to their livest contractors; of contractors to mention only their best day's run; and of equipment concerns to advertise only the job where their equipment was highly successful, have all created false impressions of the possibilities of construction progress. The record run that an outfit can make once in a season is a poor criterion by which to judge the efficiency of the outfit. Yet the public, and to too great an extent the profession itself, have these figures in mind in judging a contractor's progress. Alongside such records the mediocre performance of the steady producer seems unromantic and uninteresting, but the fable of the hare and the tortoise is as true today as it was when first told."

The low efficiency apparently indicated by many of the figures here given may lead to the thought that the contractors on the Iowa pavement were a small calibre bunch. As evidence that this is not true some of the individual records are here appended. While they, in no instance set new marks for the contracting fraternity to shoot at, it is believed that they show that the organizations which have laid the Iowa pavements are well organized and alive to the necessities of their jobs.

One contractor between June 16 and July 30 inclusive, 45 calendar days, worked every day but the 7 Sundays and holidays, or 38 successive working days, laying in that time 20,658 feet of 18 foot pavement. This was an average of 543.5 feet per day or 231½ cubic yards of concrete.

Another contractor using two separate outfits, worked both outfits every calendar day for 34 successive days from September 21st to October 24, 1921, laying in this time 29,347 linear feet of 20 foot pavement 8 inches thick with integral curb and gutter. This was a total of 5.56 miles or an average of 432 linear feet per day. Reduced to cubic yards this made 218 cubic yards per day per outfit. Not the least interesting feature of this run was that a weighted average of the haul shows every ton of this material hauled a trifle over five miles. The bulk of it was hauled over a hill road containing seven adverse 6 per cent grades and many smaller ones. A large share of it was hauled up a single grade 9,000 feet long a part of which was 6 per cent and which had a number of curves. Practically all the remainder was hauled up a grade a mile long, with several curves and some 6 per cent grades. To complete the difficulties a move was necessary with one of the outfits. By bringing in an extra mixer the remainder of the equipment was moved 15 miles across country and some pavement was laid on the same day.

One contractor using a 31-E paving mixer completed 11 miles of pavement in 1922 at the rate of 608 feet for every day he turned a wheel and was at it 64 per cent of the time.

Another contractor finished 16 miles of pavement in 1922 at the rate of 714.5 feet for every day worked. He worked 67 per cent of the time and yet made two long moves by rail during the season. This same contractor finished his last job by a continuous run of 20 calendar days at the rate of 920 feet per day, laying 18,400 feet of pavement in this time. The working day of this outfit was 10 hours long and this was seldom exceeded by more than a few minutes.

Runs of 1,000 to 1,200 feet are numerous and 800 feet was the common thing with many outfits.

There can be no debate about the expensiveness of lost time on construction work. The engineering force on the job is there and cannot be used for any other useful purpose as a rule, during the idle times. No increase in the engineering personnel would ordinarily be required if the lost time were eliminated.

Also the contractor in order to continue being a contractor must make a living from his business, and it is impossible to hoodwink ourselves by trying to believe that the cost of his lost time is not charged to the work.

It would seem to be a matter of common interest among all concerned to join forces and do whatever is possible to eliminate waste time. All would profit in the end, the engineer by reputation for efficiency, the contractor by increased output, and the public by reduced costs. Even the machinery manufacturers and material men have an interest, in the increased demand for their products.

These data and conclusions have the very common fault of being destructive rather than constructive. The writer has no solution to offer for the problem presented. In fact, it probably has no single solution. The betterment of the conditions noted will more likely come through the gradual whittling down of the delays at every point by the united efforts of all concerned.

The duty of the engineer in the matter seems clear. It will be his function to point the way, inasmuch as in his hands lie most of the facts and figures, or the opportunity to collect them. In this connection it is the desire of the writer to appeal to others more favorably situated than we are in Iowa, to keep similar records of lost time on highway work. Our program is small and our territory limited while by extending this process to other states soon a valuable mass of data would be on hand.

The Week's Developments in a Nutshell

Conditions in the building industry throughout the continent are that average costs keep rising. In spite of this, activity is increasing. In the United States indeed this activity is in the nature of a boom, where price advances seem to act as a spur, as if the idea prevailed that by immediate action builders would forestall still higher costs. This must, almost inevitably, end in a crash.

In Canada, fortunately, the movement is on much more conservative lines. Nothing approaching a boom is in progress and yet, looking back over a few months, we can definitely say that business is better. We are following the very wise maxim of 'making haste slowly' and without doubt we are in a more sound condition than our neighbours to the South. Except in rare cases the supply for new building is not meeting the demand.

Financial authorities, in general, are agreed that the conservative improvement being shown in Canada will be maintained throughout the present year and very probably into 1924. That is long enough to look ahead. In all probability, before the present year is over, the climax toward which the United States seems to be heading will have been reached. This will naturally be followed by a surplus of both labor and materials with consequent concessions in prices. Canadian workmen who have crossed the line to seek higher wages will return and if at that time Canada has not over-built, conditions will be very favorable for a continued steady onward movement.

Several lines of iron and steel for building purposes registered price increases in the Toronto district during the past week, mild steel bars, ¼" and heavier, advancing from $3.75 to $3.90 per 100 lbs.; bands, 3/16" and lighter, from $4.25 to $4.40; angles, from $3.90 to $4.00; channels and tees, from $4.50 to $4.75; plates, ¼" and heavier, from $3.50 to $3.75, 3/16" from $4.00 to $5.25, and 10-gauge from $4.40 to $4.60; black sheets, from $5.50 to $5.60. The price of hoops ranges from $4.95 per 100 lbs. for the 2½ x 15" to $10.00 for the ⅜ x 13".

The price of linseed oil, both raw and boiled, and turpentine, in this district, has been fluctuating, if anything, a little more rapidly than usual during the past week or so. The price on these items at the present writing, however, is as follows: boiled linseed oil, per gal. $1,38; raw, $1,35; turpentine, $1.95, the latter a slight reduction.

Lumber, the other active item in the building supplies market, showed a tendency to slacken up during the past couple of weeks, but there are no price changes of any importance reported.

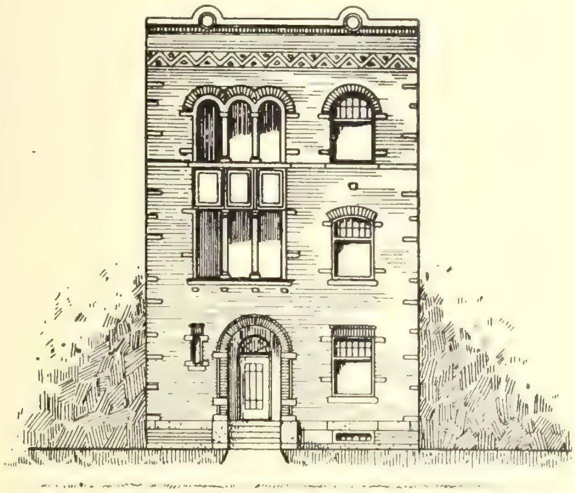
The Contract Record's

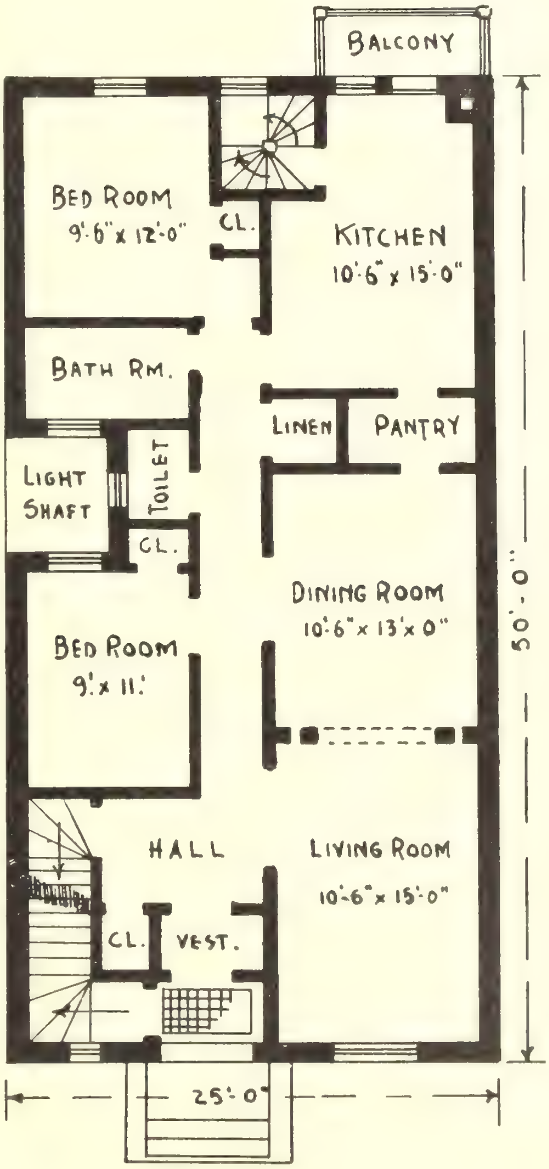
Weekly House Suggestion No. 68

In this week's issue is illustrated a house design according to which a series of apartment houses are just going to be erected in one of the residential districts of Montreal. Each of these houses is estimated to cost $15,000 and will be of solid brick on concrete foundations. They will contain three residences each and a basement and will occupy a space of 50 x 25 ft.

There are five rooms of comfortable size on each floor, with ample closet and storage space. The upper floors have a sunroom. The kitchen is provided with a combined permanent refrigerator and cold water reservoir, together with all other modern improvements, including a gas heated hot water tank. The toilet and bathroom are finished with a cement tile imitation. The vestibule floors are of tile and marble and all other floors are covered with a sheet of cork. The stairs are provided with a metal nòn-slip safety tread. All interior woodwork is of red pine and the plastered surface is finished with Rockwall cement. The dining room walls are panelled. The exterior wall at the front will be of buff brick, with ½-in. x ½-in. hollow joints.

Mr. J. A. Houle, architect of Montreal, designed these houses.





Mainly Constructional

East and West—From Coast to Coast

The [illegible] Construction Co. Inc., of New York, Frederic Culver, president, have purchased a site on the north-east corner of Sherbrooke and Redpath Streets, Montreal, and intend to erect thereon, through a company with a Canadian charter, incorporated for that purpose, a 10-storey apartment building. This company is well known on the other side, their operations being financed by stock subscription. Walter Molson & Company, 263 St. James St., Montreal, are the selling agents.

The city of Edmonton, it is reported, is to secure a reservation on a block of land in the McMurray tar sand district, sufficient to assure the city of an ample supply of paving material for its streets for an indefinite period.

The provincial government has granted leave to the Vancouver and District Joint Sewerage Board to lower the water level of Burnaby Lake, an undertaking considered necessary to take care of all drainage from the Still Creek area, which is more or less inundated during the winter months. The Board must, however, assume full responsibility of any damage claims that may arise out of the undertaking.

The Department of Highways have purchased a frontage of 50 ft. on Simcoe St., Toronto, immediately at the rear of the Department's Building, at the corner of University and Dundas streets, on which it is understood they propose erecting an addition.

In response to a request by the city of Three Rivers, P.Q., that the provincial government assume two-thirds of the cost of repairing and maintaining the St. Maurice River bridges, the province has offered to pay for one-half the cost of this work, provided such work is carried out according to the approved plans of the Provincial Department of Public Works.

Premier Veniot's estimate of the damage sustained to the province's public works by the recent flood conditions in New Brunswick is $500,000. Department engineers are inspecting the damage done to roads and bridges throughout the flooded areas.

A recent report states that the steelwork on the new city hall at Montreal is nearing completion and tenders for the balance of the work will be called shortly. About $200,000 has already been spent on the new structure, which will not be completed for about a year.

At a recent meeting of the Quebec Golf Club it was decided to issue bonds to the amount of $75,000, the money to be spent on a new course which the club has acquired just east of the present course, on the opposite side of the Montmorency River.

According to a recent statement of one of the officials of the Buffalo-Fort Erie Bridge Company, a start will be made on the construction of the Buffalo-Fort Erie bridge about June 1. This must not be confused with the project to enlarge the present International Bridge. All that remains to be done before starting the former structure is to secure the permission of the U.S. Department of War.

A proposal to borrow $145,000 for public improvements at the town of Shawinigan, P.Q., was voted on favorably by the electors recently.

At a recent meeting of the members of the Parkdale Canoe Club, Toronto, unanimous and enthusiastic approval was given to the proposal to replace the club house burned recently with a new quarter-million dollar building. No definite plans have been made as yet, but the members are anxious to make an actual start on rebuilding as soon as the insurance claims have been adjusted.

About $2,300,000 is to be spent on the construction of roads and bridges in the province of British Columbia this year, Hon. W. H. Sutherland, Minister of Public Works, announced recently.

Plumbers at St. Catharines have received an increase of 10c an hour, the rate going into effect on the termination of the present agreement in June being 85c an hour.

At the end of 1924 the Provinces of Ontario, New Brunswick, Nova Scotia and British Columbia will have earned the sums allotted to them respectively for highway construction under the Canada Highways Act, according to a statement made in the House recently by Hon. George P. Graham, Minister of Railways and Canals. Some interesting figures were given by the Minister showing the amounts allotted and the amounts earned up to the end of 1922 by the various Provinces. The Provinces, the amounts allotted and the sums earned are as follows:

	Allotment.	Earned.
Alberta	$1,477,810	Nil.
British Columbia	1,251,265	$1,116,383.87
Manitoba	1,602,265	525,964.27
New Brunswick	1,163,845	1,107,479.36
Nova Scotia	1,468,720	1,357,633.57
Ontario	5,877,275	5,841,577.88
P. E. Island	603,455	254,871.53
Quebec	4,748,420	2,452,477.62
Saskatchewan	1,806,255	766,343.79

The Haileybury Information Bureau, Haileybury, Ont., is inviting the co-operation of contractors who are located here, or who intend to locate here, in the matter of getting in touch with intending builders. A registry of contractors has been opened at the office of the secretary, J. D. Macdonald, Ferguson Ave., and all contractors are requested to register there, giving a reasonable amount of information as to their standing, etc. This will be used in giving advice to those seeking information on building questions. The Bureau, under the presidency of Mr. F. W. Hutt, is doing very useful work in connection with the rebuilding of the town of Haileybury.

Personal

Mr. Arthur J. Everett, architect, of Toronto, has moved his office from 57 Queen St. W., to 219 Bay St.

Mr. Alex. Stewart, architect, of Quebec, P.Q., has been notified that he has successfully passed the necessary examinations for membership in the Society of Architects of London, England.

Capt. Robert McKnight, C. E., has been appointed engineer of suburban area work, for the Suburban Area Commission of Owen Sound, Ont.

The following Toronto architects have taken office space in the Bank of Commerce Bldg., Bloor and Yonge Streets, Toronto. Messrs. D. E. Kirkland, 830 Bloor St. W.; E. D. Yeigh, 45 Bloor St. E.; J. Francis Brown, 2 Bloor St. E.; F. E. Belfry, 438 Runnymede Rd. and W. L. Somerville, 45 Bloor St. E. Mr. Brown and Mr. Belfry are already located in their respective new quarters, but the other gentlemen do not contemplate moving until about June 1.

Mr. H. H. Angus, engineer, of Toronto, is moving his offices from the Continental Life Bldg. to the Bank of Commerce Bldg., Bloor and Yonge Streets, about June 1.

Mr. Harold H. Perry, manager's assistant, Industrial Works, Bay City, Michigan, sailed on April 28 for England. While abroad, Mr. Perry intends to make an extensive study of locomotive and wrecking cranes as used in that country.

CONSTRUCTIONAL ACTIVITY

Period of May 9 to May 15, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Burlington, Ont.

McKay & McKay, Home Bank Bldg., Hamilton, are preparing specifications for the paving of Locust St., from Water St. to Ontario St.; Locust St. from Ontario St. to Birch Ave.

Brantford, Ont.

Lee & Nash, Temple Bldg., have prepared plans for a drain for Burford Township which includes 6 bath basins, 1 head wall and 1,200 feet of open drain. Tenders for this work will be received by F. W. Taylor, Township Clerk, c/o the engineers.

Chatham, Ont.

W. G. McGeorge, County Engineer, will receive tenders until May 25 for the following pavements and bridges: 1 1/3 miles of reinforced concrete pavement north of Wallaceburg. 2/3 miles of reinforced concrete pavement south of Dresden. 2 concrete and steel bridges of 28 ft. span, 1 reinforced concrete bridge of 10 ft. span and one reinforced concrete culvert, 6 ft. span, between Chatham and Wallaceburg.

Cobalt, Ont.

It is understood that the Provincial Government will make a substantial expenditure to improve the road leading to the Lorrain mining camp. C. M. Fullerton, director of the Northern Development Branch, Toronto, wired the "Cobalt Northern Miner" to this effect in response to an inquiry.

Eastview, Ont.

The Town Council will pave various streets at a cost of $7,600. Materials for this work have not yet been purchased.

Pipe for sewers, estimated to cost $33,345, will be purchased in the open market. Work will be done by day labor. This work will proceed shortly.

Ford, Ont.

Sidewalk on the west side of Pillette Rd., from Ottawa St. to the C. N. R. tracks is contemplated by the City. McColl & Patterson, Imperial Bldg., Walkerville, engineers.

Galt, Ont.

Petitions for cement sidewalks on Salisbury Ave., Forest Rd., and Waterside Ave., and for curbs and gutters on Waterside Ave. and Kay St., have been received by the City Council. Mr. McCartney, Clerk.

The Fire & Light Committee has recommended that the City install a three-way hydrant in the lane south of the Armories in order to give adequate fire protection to several plants.

Grand Forks, B. C.

G. W. Dwyer, District Engineer, has announced that an appropriation has been made to macadamize about nineteen miles of new highway between Cascade and Rossland, graded last year. Tenders for this work may be called shortly. The engineer also intimated that the remaining fifteen miles of roadway might be completed this summer.

Damage estimated at $50,000 was done to the surrounding country when a dam, a 20-ft. concrete structure, costing $25,000 burst. This dam was used in connection with an irrigation system.

Halifax, N. S.

Tenders will be received by the Provincial Highway Board until noon on the dates below mentioned for the following gravel surfaced roads: Halifax-Yarmouth, via Annapolis Valley, 1. Kentville-Rafuse road 6.57 miles—May 21. 2. Rafuse-Millville road, Aylesford, 8.04 miles, May 21. Halifax-Yarmouth, via South Shore Route, 3. Liverpool-Broad River bridge, 10.03 miles, May 23, 4. Broad River Bridge-Port Loli, 7.52 miles, May 23. Truro-Glace Bay road, Pomquet Road—Black River Bridge, Monastery, 11.7 miles, May 23. Plans and specifications governing this work may be had from the Offices of the Highway Board.

Hamilton, Ont.

Tenders will be called by W. L. McFaul, City Engineer, for asphalt pavement for Cumberland Ave. from Sherman to Prospect St., costing $24,625.

The city will shortly call tenders for pipe sewers on King St. from Paradise Rd. to Bond St., costing $12,450. S. H. Kent, clerk.

Huntsville, Ont.

According to an order from the Provincial Board of Health, Huntsville must install a chlorinating plant. Reports state that a plant which will meet the approval of the Board will cost about $22,000.

Kitchener, Ont.

City Engineer Shupe has recommended the installation of a sewerage disposal plant consisting of an activated sludge plant, with gravity system and a booster pump, to be installed in a station erected on spring Street. The cost of this work is estimated at $83,000.

The City Engineer, will receive tenders on the following supplies until May 19: 50% asphaltic road oil (give specifications), manhole and catch basin castings, (per lb. and per piece f.o.b. Kitchener), two reinforced concrete culvert 17 ft. and 7 ft., spans, two travia pavements, 3,500 sq yds., ond mile of concrete walk five feet wide. Necessary information and plans may be obtained from the engineer's office.

Leaside, Ont.

Leaside Town Council has lodged a formal protest with the Provincial Board of Health against conditions at the sewage disposal plant at Soudan Ave.

Mimico, Ont.

Tenders for the laying of approximately 6,000 sq. yds. of pavement, with concrete base and bituminous top, will be received by W. B. Redfern, 1004 Excelsior Life Bldg., until May 21.

Montreal, Que.

Greenfield Park voters recently passed a by-law expressing themselves in favor of borrowing $70,000 to be used for the installation of watermains and sewers on the main streets. It is stated that this is a preliminary action to installing water and sewers throughout the town.

Napanee, Ont.

Town contemplates laying 1,200 ft. of 6 inch pipe and installing two hydrants at a cost of $2,500. W. A. Grange, clerk.

Newmarket, Ont.

Sewers on Pearson, Court and Hamilton Sts. are contemplated by the Town Council. P. J. Anderson, clerk.

Ottawa, Ont.

Ottawa Suburban Roads Commission, Thistle Bldg., will receive tenders for an asphalt pavement to be laid at Bowiesville, near Ottawa, until May 22. Allan K. Hay, engineer.

Ottawa Suburban Roads Commission is also receiving tenders for two miles of asphalt pavement at Metcalfe Road, near Ottawa.

The city engineer estimates that 3,000 sq. yds. of asphalt paving for Catherine St. between Bank and O'Connor St., will cost $14,000 and that 5,500 sq. yds. of asphalt paving for Betham Rd. between Irving and Parkdale Aves. will cost $27,000.

Owen Sound, Ont.

Council has decided to have 2nd Ave., between 8th and 14th Streets paved and the necessary combination sewers will be constructed. This work will cost about $80,000.

Pembroke, Ont.

Town Council will lay 13,300 ft. of concrete sidewalks on 17 streets this summer. Work will be done by day labor and materials purchased locally.

Port Hope, Ont.

Tenders will be received by the Council until May 21, for the construction of sewers on Dorset, Ontario, College, Harcourt, Park, John, Robertson Sts. J. W. Sanders, Town Clerk.

Quebec, Que.

Plans are being prepared for a gravel road 12 miles long at Metapedia. E. Normandeau, Parliament Bldgs., engineer.

About $5,000,000 will be spent this

[illegible] the Provincial Government for [illegible] Completion of work in progress and the necessary repairs to highways.

Ridgeway, Ont.
[illegible] for concrete sidewalks will be received by M. S. Pound, clerk of Bertie Twp., [illegible] until May 19.

St. John, N. B.
Estimates as to the cost of paving Market Square, Britain St., and Waterloo St. will be prepared for the Council by Commissioner Frink.

St. Raymond, Que.
J. E. Savery, clerk, St. Raymond, will receive tendrs until May 28 for 12 in., 8 in., 6 in. and 4 in. cast iron pipe for the $250,000 waterworks system.

St. Therese, Que.
Provincial Department of Highways is receiving tenders until May 22 for paving the lower road in St. Therese, 2.51 miles long and Montre du Moulin, 0.71 miles long, with macadam.

Tara, Ont.
Tara Council will purchase a 6,000 gallon tank of fifty per cent asphalt oil for roads. Reeve Hamilton, interested.

Teeswater, Ont.
A by-law, authorizing the pavement of the main street, will be submitted to the ratepayers on June 1. W. H. Logan, clerk.

Three Rivers, Que.
By-laws authorizing the construction of the following pavements will be submitted to the ratepayers shortly: Macadam pavement, Bellefuille, St. Denis, Laurent, St. Oliver Sts. and Normand Blvd., costing $39,214.36; concrete pavement, Sts. Julie, St. Maurice, St. Volentaire, Notre Dame and Lavoilette Sts., costing $57,175, approximately 4 miles; concrete sidewalks, St Louis Blvd., $5,167, 6 ft. x 2,500 ft., with curb; concrete pavement, Sts. Marguerite St., city limits to St. Denis St., costing $66,500, 3 miles long; grading, levelling and opening new streets, $5,885.75; widening of Des Forges, St. Denis and Plaisante Sts., costing $20,907.60; waterbound macadam pavement, Bellefeuille St. and Gervais St. to C.P.R. tracks, $5,125; bituminous macadam pavement, Royale, Hart, Champlain, Alexandre, St. Denis, St. Joseph, St. Oliver and St. Paul Sts., $54,089. Plans for these works have been prepared. Chas. Gelinas, City Engineer.

Plans have been prepared and by-laws for the following waterworks will be submitted to the ratepayers, shortly: Aqueduct and sewer, Boulevard St. Louis, $5,720; aqueduct, Des Forges St., $3,910; aqueduct and sewer, Notre Dame and Gilmore Sts., $3,190; extension to services in aqueduct and sewer, $7,820; new water intake at the pumping station, $5,192. A filtration plant, costing $250,000 is contemplated by the council.

Timmins, Ont.

A grader, two dump wagons and a sprinkler will be purchased at once by the Town Council. Mr. McInnis, mayor.

Mayor McInnis announced at a recent meeting of the Town Council that the Provincial Government intended to construct a Travia road from Mattagami River landing to South Porcupine and from the latter point to Iriquois Falls. This road will be of a much better standard than the colonization type which had been planned originally.

Toronto, Ont.
The Chairman of the Board of Control will receive tenders for laying waterpipes on Swanwick Ave. and Lambert Ave. until May 22. Specifications may be seen at Room 320, City Hall.

Tenders for the following work will be received by the Chairman of the Board of Control until May 22: Laying of water pipes, Lambert Ave., from 30 ft. east of the west street line Caledonia Rd. to 342 ft. west. Swanwick Ave., from 17 feet west of the east street line pickering St. to 225 feet east of the east street line pickering St. Further information may be obtained from Room 320, City Hall.

Truro, N. S.
The Town Council has decided to lay a concrete pavement 18 feet wide on Forrester St. from Prince to Victoria St. Funds for this work were voted two years ago.

Victoria, B. C.
Hon. W. H. Sutherland, Provincial Minister of Public Works, has announced that $2,300,000 will be spent by the province on roads and bridges this year. About $1,396,000 will be user for highway construction, $700,000 for bridges and $200,000 for the construction of settler's roads in the newer sections of the province. The principal items on the program are: Completion of three miles of concrete roadway on the Victoria-Sydney Highway; construction of Tofino-Ucluelet road, on the west coast ot Vancouver Island; two miles of hard surfacing near Nanaimo; construction of Fulford Harbor road on Salt Springs Island; Hastings-Bartlett road and a contribution of $35,000 towards the Stewart-Hyder road; reconstruction of 12 miles of roads in the Invermere district for the Banff-Windermere Highway. The Courtenay River bridge will be replaced with a steel structure and the Chemainus River bridge reconstructed.

Waterloo, Ont.
Duke St. from King to Albert St.; George St. from King to Willow Ave.; Willow Ave. from Allen to Union St.; Herbert St. from Union to Queen St.; John St. from King to Park St., were included in the Council's paving program for this year.

A recommendation that a hydrant should be placed at the corner of Weaver street, between King and Queen, was passed by the Council.

Windsor, Ont.
Essex Utilities Commission will acquire the property between Ottawa St. and the C.N.R. tracks, Ford, as the site for the filtration plant, at a cost of $40,000.

CONTRACTS AWARDED

Kingsville, Ont.
Watermains and sidewalks costing $12,000 will be laid for the Town this spring. Sherman Bros., will lay water mains and Rumble Bros. will lay the sidewalks.

Lindsay, Ont.
Standard Paving Co. Ltd., Ottawa, is paving Durham St., from Lindsay St. west to the Provincial Highway, for the Victoria County Council.

Montreal, Que
The city executive has recommended that the contract for 1,500 feet of 48 inch steel pipe be awarded to Walsh Pipe and Structural Works, at $36,750. Arrangements are being made to lay this pipe from the pump house to the vicinity of Youville square.

Pictou, N. S.
Fraser Paving and Construction Co., New Glasgow, have been awarded the general contract for concrete sidewalks for the Town at $6,000.

Quebec, Que.
Nap. Trudel & Sons, St. Irenee, Charlevois County, have been awarded the contract by the Minister of Highways, Que., for the building of sections 1 and 2 of the Levis-Saint Lambert waterbound macadam highway. Cost of No. 1, $62,287; No. 2, $33,381.

Regina, Sask.
The Provincial Government has awarded the following contracts for road improvements: From Kerrobert South, W. J. Doyle, Major, Sask.; from Elrose South, Bryson & Sons, Duck Lake, Sask.; from Amazon to Watrous, Forshner Bros., Prince Albert, Sask.; from Assiniboia to Limerick, Forshner Bros.

Stratford, Ont.
The City Council has awarded the contract for 35,000 sq. yds. of concrete base for an asphalt pavement, and 32,000 lineal feet of curbs and gutters to Lindsay Malcolm, 167 Collingwood St., Kingston, at $81,000. Merlo, Merlo & Ray Ltd., Sandwich St., Ford, have the contract for the asphalt top, 35,000 sq. yds., 6 inches thick, at $55,000.

Toronto, Ont.
McGregor & McIntyre, Ltd., 1139 Shaw St., Toronto have the contract for steel for North York Twp., waterworks plant. Baines & Davis Ltd., 98 Esplanade, east have the contract for reinforcing steel.

Additional contracts for roadwork awarded by the Provincial Government are: 1003, macadam base, Dunnville from the east limits of Niagara St., easterly five miles, including grading, Bate, McMahon & Co., Central Chambers, Ottawa. 1006, grading from Welcome Corners to Dale, 2.5 miles, J. R. Wilkinson, Port Hope. 1005, grading from Beachburg, easterly, 6 miles, J. R. McQuigge, Arnprior.

Railroads, Bridges and Wharves

Cranbrook, B. C.
District Engineer J. C. Brady has received word that the Department of Public Works will finance repairs for the Wasa bridge.

A bridge over Cranberry Creek, South Atlin, washed out four years ago, will be replaced at a cost of $1,500. The Department of Public Works has authorized this expenditure.

Fernie, B. C.
Fifty miles of the Calgary & Fernie Railroad, commenced in 1912, will be constructed this summer, according to a statement made by Frank Crandell, a director of the company. This road has been surveyed for its entire distance of 157 miles, and when completed, together cost $3,500,000.

London, Ont.
Chas. Talbot, County Bldgs., London. has prepared plans for a concrete and steel bridge for East Williams Twp., costing $6,000. Tenders are being reveived by W. McAllum, clerk, Nairn, Ont.

Montreal, Que.
City authorities have announced that the mountain tram line along the Shakespeare Road will be built this summer and that a plan for draining the roadway had recently been prepared at the City Hall.

Moose Jaw Sask.
Many improvements will be made to the Canadian National lines in the Moose Jaw District this summer, was the announcement made by T. B. Chappell, general superintendent for Saskatchewan. Tracks will be ballasted and all property placed in first class condition.

Ottawa, Ont.
Tenders for the reconstruction of the northerly 200 ft. of the slip wall, will be received by the Dominion Department of Public Works, R. C. Desrochers, secretary.

Quebec, Que.
The Provincial Government, Department of Colonization and Mines is preparing plans for wooden bridges at the following points; Sheldrake, Saguenay County, one, 80 ft. long; Ste. Florence de Beaurivage, Matapedia County, three bridges each 120 ft. long, concrete pillars; Riviere Autonnerre, Saguenay County, one, 250 ft. long, 250 pillars. E. D. Normandeau, Parliament Buildings, Quebec, engineer.

St. Canut, Que.
Lumber, steel and cement for three bridges costing $30,000 will be required by the Town, which contemplates these structures at a cost of $30,000. Raoul Longpere, secretary.

Three Rivers, Que.
The Provincial Government has promised a grant of $100,000 towards the rebuilding of bridges across the St. Maurice River, at Three Rivers, costing $160,000. A. Normand, Mayor of Three Rivers.

Toronto, Ont.
A bridge across the Humber River, connecting Bloor street with the Provincial Highway to Islington, about 900 feet long, may be built by the Provincial Government.

The Provincial Government will discuss with the Dominion Railway Board the building of a subway on Danforth Ave., at the C. N. R. tracks.

A radial between Port Credit and Oakville is contemplated by the Hydro-electric Commission, University Ave., Toronto.

Tenders for a steel bridge over Blanche River, one through truss span 100 ft. centre to centre of bearings, will be received by the Northern Development Branch of the Department of Lansds & Forests, until May 28. Further details may be had from C. H. Fullerton, Toronto.

Department of Lands & Forests, Northern Development Branch will receive tenders for a steel bridge, 90 ft. long, over Katrine Bay on the Severn-North Bay Road, approximately three miles from Burk's Falls Station. The bridge will consist of one through truss span, until May 28. C. H. Fullerton, Director.

CONTRACTS AWARDED

St. John, N. B.
R. M. Tobias, St. John, has the general contract for a bridge for the Provincial Government at "Humphrie's Mill Pond," in Westmoreland County.

Toronto, Ont.
York Township Council has awarded the general contract for "Governor's Bridge," to connect Astley Ave. and Oakdene Cres., to Goldie Construction Co. Ltd., 32 Church St., Toronto. F. G. Engholm, 56 Huntley St., consulting engineer for the Township of York.

Windsor, Ont.
The Considine-Reed Construction Co., Windsor, has the general contract for remodelling slip docks at the foot of Caron Ave., for the C.P.R. at a cost of $60,000.

Public Buildings, Churches and Schools

Cornwall, Ont.
J. R. Simpson, County Bldg., Cornwall, will receive tenders for a school building for S. S. No. 2, until May 19.

Edmonton, Alta.
Edmonton School Board will submit a by-law to the ratepayers authorizing an expenditure of $295,000 for the building of three new schools. The date on which the by-law will be submitted has not yet been decided.

Hamilton, Ont.
Hon. Walter Rollo announced that the Provincial Educational College would be located in Hamilton. The city will provide a site with a frontage of 431 feet on Huron St.

Huntsville, Ont.
Huntsville Ratepayers passed a by-law authorizing the expenditure of $27,000, for the purpose of making a four-roomed addition to the Central School.

Kincardine, Ont.
The Masonic Lodge, c/o W. M. H. R. Magwood, is discussing the building of a block of stores having lodge rooms above. This structure, if erected, would cost $20,000.

Leaside, Ont.
The Town Council is issuing bonds to the amount of $100,000 to provide funds for the erection of a new school. Construction will commence at once.

London, Ont.
Tenders will be called by Watt & Blackwell, Bank of Toronto Bldg., about May 31 for a nurses' home in connection with St. Joseph's Hospital. This structure will be four storeys high with a basement, 120 ft. x 150 ft., white brick construction.

Montreal, Que.
Plans are being prepared for the Montreal Unit of Shriners by Hugh Vallance, 128 Bleury St., and J. M. Miller, 364 Dorchester St., for a hospital. Tenders for the construction of this building, estimated to cost $250,000 will be called about July 1.

Quebec, Que.
The Catholic School Board has approved the plans for a twelve room school in Belvedere Ward. Tenders for this building will be called shortly.

Toronto, Ont.
North Broadview Presbyterian Church contemplates the erection of an edifice on Broadview Ave., costing $85,000.

St. Columba Church, St. Clair Ave. and Vaughan Rd., is conducting a Campaign to raise $50,000 for the erection of a new Sundy School, equipped with a gymnasium. Charles M. Nave, Lauder Ave., is chairman of the building committee.

An administration building costing $1,250,000 will be erected in Queen's Park by the Ontario Government. The location chosen is on the east side of the park and has a frontage of 295 ft. and a depth of 264 ft.

The Y. W. C. A., 21 McGill St., has launched a campaign to raise $380,000 to be used principally for building purposes. Two new branches in the east and west ends of the city are contemplated as well as the remodelling of the McGill St. building and the five association residences.

CONTRACTS AWARDED

Brantford, Ont.
Schultz Bros. Co. Ltd., have the general contract for the $81,000 addition to the Collegiate, consisting of four rooms, of concrete, stone and brick construction.

Charlottetown, P. E. I.
Masonry, steel, carpentry, roofiing, painting and sheet metal contracts for the $200,000 hospital for the Roman Catholic Corporation have been awarded to Phillips & Clark, 35 Grafton St., at $90,000.

St. Hyacinthe, Que.
Ulric Boileau Ltd., 568 Garnier St., Montreal, has the general contract for a college for the Freres Maristes, costing $135,000. Building will be 4 storeys high, 170 ft. x 47 ft., concrete, brick and stone construction. No materials have been purchased. All sub-tradee will be let by the general contractors.

Sherbrooke, Que.
The contract for the new Methodist Church at Coaticook, Que., to replace the building resently destroyed by fire, was awarded to the Newton-Dakin Co. Ltd., Sherbrooke, at $25,000. H. G. James, Sserbrooke, architect.

E. T. Construction Co., Sherbrooke, have been awarded the contract for the

(Continued on page 59)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders Wanted

[illegible] Municipal [illegible] Damascus [illegible]

Saturday the 26th day of May,

[illegible]

Plans and specifications may be seen at the Reeve's residence Lot 5½ 16, Con. 14 or at Damascus on day of letting contract.

Lowest or any tender not necessarily accepted.

W. W. DUNCAN
[illegible] Clerk.

New School

[illegible] marked as to contents, will be received by the undersigned until 8 p.m.

Friday, May 18th, 1923,

for the erection of a four room school, School [illegible] No. 2 Cornwall Township.

Plans and specifications may be seen at the office of the Secy-Treas. County Buildings, Cornwall, Ont.

Lowest or any tender not necessarily accepted.

JAMES R. SIMPSON
Secy-Treas.
19-20 Cornwall.

TENDERS

Sealed tenders will be received by the undersigned up to twelve o'clock noon,

Monday, May 21st, 1923,

for the construction of Sewers on Dorset, Ontario, Hope, College, Harcourt, Park, John and Robertson streets, are invited by the Council of the town of Port Hope.

Plans and specifications may be seen at the office of the undersigned.

The lowest or any tender not necessarily accepted.

I. W. SANDERS,
20 Town Clerk.

SEALED TENDERS

Addressed to J. Knox, Secretary, S.S. 35 Township of York, 189 Rosethorn Avenue, marked tender, will be received until

May, 30th, 1923,

for Painting and Glazing of addition to Silverthorn School.

Plans and specifications may be seen at the office of the architect, Mr. Franklin, 587½ Yonge Street.

The successful tenderer will be required to furnish a bond for the due observance and fulfilment of the terms and obligations of the contract.

The lowest or any tender will not necessarily be accepted.

ERNEST G. WESTBURY
20 Chairman Board of Trustees.

RATES

20 cents per agate line (14 lines to the inch). Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Department of Lands and Forests, Ontario

Northern Development Branch

Sealed tenders, endorsed "Bridge over Katrine Bay," will be received by the undersigned up till noon on

Monday, the 28th May, 1923,

for the Supply, Delivery, and Erection of the Steel Superstructure for a Highway Bridge over Katrine Bay on the Severn-North Bay Road approximately 3 miles from Burk's Falls Station on the Grand Trunk Railway.

The Bridge will consist of one through truss span 90 feet Centre to Centre of bearings.

Plans, Specification, and other information can be secured at the office of the undersigned.

C. H. FULLERTON,
Director.
Department of Lands and Forests, Ont.,
Northern Development Branch,
Parliament Bldg., Toronto, Ont. 20

TENDERS
for Concrete Pavement

Tenders will be received by the undersigned up to two o'clock P.M.

Monday, the 28th day of May, 1923,

for the construction of Re-inforced Concrete Pavement seven-eighths of a mile in length, to be laid in two twelve foot widths (centre strip in Street left open), with curbs on each side of Street, together with Catchbasins and Manholes. (In the current issue of the Contract Record is an advertisement for the County of Essex asking for Tenders closing the same day for Pavement in Mersea Township which is a continuation of this Pavement herein advertised). The Tender for Leamington Pavement to include a further section of re-inforced Concrete Pavement approximately 800 feet long by 22 feet in width with Curbs on both sides and with Manholes and Catchbasins.

Plans and Specifications to be seen at the Office of J. J. Newman, C.E., Davis Block, Windsor, and at the Office of the undersigned. Marked cheque for one thousand dollars must accompany tender.

No tender necessarily accepted.

Dated, Leamington, May 10, 1923.

R. M. SELKIRK,
20-21 Town Clerk, Leamington, Ont.

TENDERS
for Concrete Pavement

Sealed tenders, marked "Tender for Pavement" and addressed to the undersigned, will be received until 1 P.M. on

Monday, the 28th May, 1923,

for about 2 miles of Re-inforced Concrete Pavement 18′ wide, on the Front Road, or First Concession, in the Township of Sandwich West. And about three-quarters of a mile of Re-inforced Concrete Pavement 18′ wide on the First Concession, in the Township of Mersea.

Plans, specifications, etc., can be seen at the office of the undersigned or at the office of J. J. Newman, C.E., Windsor, Ont.

All work let subject to the approval of the Dept. of Highways.

A marked cheque for $1,000.00 must accompany tender for each piece of work.

The lowest or any tender not necessarily accepted.

W. P. COYLE,
20-21 Clerk, Essex County, Sandwich, Ont.

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tender for Project 3, Section G, subsection (c)" will be received by the undersigned until eleven a.m. standard time.

Wednesday, June 6th, 1923,

for the Excavation of approximately 31,000 Cubic Yards of Earth and other work required in the construction of Provincial Highway from Polwarth north-west 5 miles.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:-

W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.; M. A. Courchene, Sec-Treasurer, Village of Debden, Sask.

An accepted cheque for the sum of $700.00 payable to the Deputy Minister of Highways, or a Guaranty Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of 3 p.m. standard time, Wednesday, June 6th 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways, Regina, Sask.,
May 16th, 1923. 20

QUANTITY SURVEYOR—Fully qualified in all classes of work wants position. Box 246, Contract Record, Toronto. 18-21

County of Bruce

Sealed tenders will be received by the undersigned up to 5 o'clock p.m. on

Monday the 18th day of June, 1923,

for the following works at the County Buildings, Walkerton, for the Bruce County Council.

1. **The Erection of addition to County Council Building.**
2. **The erection of Central Heating building and trenches for pipes.**
3. **The Installation of Central Heating Plant.**

Plans and specifications may be seen and Forms of Tender obtained at the office of the undersigned on and after the 25th May, 1923.

FRED B. JAMES,
20-22 Architect, Walkerton, Ont.

Department of Lands and Forests, Ontario

Northern Development Branch

Sealed tenders, endorsed "Bridge over Blanche River," will be received by the undersigned up till noon on

Monday, the 28th May, 1923,

for the supply, delivery, and erection of the Steel Superstructure for a Highway Bridge over "The Blanche River on the boundary line of the Townships of Dack and Evanturel in the District of Temiskaming."

The Bridge will consist of one through truss span 100 feet Centre to Centre of bearings.

Plans, Specification, and other information can be secured at the office of the undersigned.

C. H. FULLERTON,
Director.
Department of Lands and Forests, Ont.,
Northern Development Branch,
Parliament Bldgs., Toronto, Ont. 20

Sealed tenders addressed to the undersigned, and endorsed "Tender for reconstruction of wharf at Blind River, Ont.," will be received at this office until **12 o'clock noon Tuesday, May 22, 1923**, for the reconstruction of the superstructure of the timber pilework wharf at Blind River, District of East Algoma, Ont.

Plans and forms of contract can be seen and specification and forms of tender obtained at this Department, at the offices of the District Engineers, Post Office Building, Sault Ste Marie, Ont.; Equity Building, Toronto, Ont. and at the Post Office, Blind River, Ont.

Tenders will not be considered unless made on printed forms supplied by the Department and in accordance with conditions contained therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p.c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

Note—Blue prints can be obtained at this Department by depositing an accepted bank cheque for the sum of **$20.00**, payable to the order of the Minister of Public Works, which will be returned if the intending bidder submit a regular bid.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
20 Ottawa, April 27, 1923.

Tenders Wanted

Sealed tenders will be received by the undersigned at 352 8th Street West, Owen Sound, up to **May 31st**, for the construction of the following

Reinforced Concrete Bridges

Lot 2 Con. 3 Collingwood Township 12 x 8½—126 yards.

Lot 38 Con. 7 Artemesia Township—16 x 5—83 yards.

Lot 36—Con. 6—Osprey Township—14 x 10—117 yards.

Lot 36—Con. 6—Osprey Township—16 x 7½—102 yards.

Plans and specifications may be seen at the office of the Engineer in Owen Sound, or at W. L. Taylor's, SINGHAMPTON.

The lowest or any tender not necessarily accepted.

R. C. McKNIGHT,
County Engineer,
20-21 Grey County.

CITY OF MONTREAL

STEAM ROLLER

Sealed tenders addressed to the Executive Committee and transmitted by registered letter, for the supply and delivery of One 10-ton TANDEM STEAM ROLLER, will be received at the City Hall, provided that such tenders be mailed not later than

May 19th, 1923,

to be opened on the 22nd, at noon.

Specifications and forms of tenders may be obtained at the office of L. O. PION, Superintendent of Purchases and Sales, 352 DeFleurimont St., and the necessary information will be given by H. A. TERREAULT, Director of Public Works, City Hall.

RENE BAUSET,
City Clerk.
City Celrk's Office, City Hall, Montreal,
May 10th, 1923. 20

City of Kitchener

Sealed tenders plainly marked as to contents, will be received by the undersigned, up to

Saturday noon, May 19th, 1923,

for season's supply of:—

. 50 p.c ASPHALTIC ROAD OIL (give analysis).

2. MANHOLE AND CATCH BASIN CASTINGS (per lb., and per piece F.O.B. Kitchener.)

and for the construction of:—

3. TWO REINFORCED CONCRETE CULVERTS (17′ & 7′ spans.)

4. TWO TARVIA PAVEMENTS (3500 sq. yds.).

5. CONCRETE WALKS FIVE FEET WIDE (1 mile).

Plans, Specifications and all necessary information, may be obtained at the City Engineer's office.

The lowest or any tender not necessarily accepted.

STANLEY SHUPE,
20 City Engineer,

TENDERS for Pavement and Bridges

County of Kent

Sealed tenders will be received by the undersigned up till noon on **Friday, May 25th, 1923**, for the following construction work.

1. **1 1/3 miles of reinforced concrete pavement North of the Town of Wallaceburg.**
2. **2/3 miles of reinforced concrete pavement South of the Town of Dresden.**
3. **2 concrete and steel bridges of 28 ft. span, 1 reinforced concrete bridge of 10 feet span and one reinforced concrete culvert of 6 ft. span, between Chatham and Wallaceburg.**

Plans and specifications and form of tender and contract may be seen at the office of the undersigned, Chatham, Ontario.

Tenders must be accompanied by marked cheques for 5% of the amounts of the tenders.

The lowest or any tender not necessarily accepted.

W. G. McGEORGE, C.E.
County Engineer,
20 Chatham, Ont.

Notice to Contractors

Sealed tenders plainly marked as to contents will be received by the undersigned up to 2 P.M. on

Monday, the 28th day of May, 1923,

for the construction of the following Municipal Drains and a Bridge in the Township of Amaranth.

Drain No. 16	**about 12900 cu. yds.**
Branch A	**about 3320 cu. yds.**
Branch B	**about 3260 cu. yds.**
Drain No. 7	**about 7690 cu. yds.**
Drains No. 25 and No. 45	**about 15180 cu. yds.**

The Rintoul Bridge, a 50-foot span reinforced concrete structure.

Tenders will not be entertained unless made upon forms supplied and unless accompanied by a certified cheque for the sum of Three Hundred Dollars payable to the Treasurer of the Township of Amaranth.

The Township shall reserve the right to rejec any or all tenders or to accept any tender.

Orangeville, May 14th, 1923.

WHEELOCK & CHRISTIE
Civil Engineers,
20 Orangeville, Ont.

Hydro Electric Power Commission of Ontario

Tender for Construction of a Power Development at Dam No. 8 on the Trent River.

Sealed tenders for the construction of Power House Foundations and Tailrace Excavation will be received by the Hydro Electric Power Commission until 2.00 P.M.

May 25th, 1923,

The work involves rock excavation amounting to approximately 90,000 cu. yds.; concrete work, approximately 2,700 cu. yds.; furnishing and setting reinforcing steel; and certain rock fills.

Instructions to Bidders, Specifications, Drawings, Form of Tender, and Schedule of quantities, may be obtained at the office of the Commission, 190 University Avenue, Toronto, on and after May 9th, on deposit of a marked cheque for $25.00, which deposit will be returned upon receipt of a bonafide tender or upon the return in good condition of all plans and documents issued.

(Sgd.) W. W. POPE,
20 Secretary.

Sealed tenders addressed to the undersigned, and endorsed "Tender for reconstruction of piers at Whitby, Ont.," will be received at this office until 12 o'clock noon, (daylight saving)

Wednesday, May 30th, 1923,

for the reconstruction of the northerly 200 lineal feet of the slip wall at Whitby, County of Ontario, Ontario.

Plans and forms of contract can be seen and specification and forms of tender obtained at this Department, at the offices of the District Engineers, Equity Building, Toronto, Ont.; Royal Bank Building, London, Ont., and at the Post Office, Whitby, Ont.

Tenders will not be considered unless made on printed forms supplied by the Department and in accordance with conditions contained therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works equal to 10 per cent. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

Note.—Blue prints can be obtained at this Department by depositing an accepted bank cheque for the sum of $10.00 payable to the order of the Minister of Public Works, which will be returned if the intending bidder submit a regular bid.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, May 7, 1923. 19-20

TENDERS
For Concrete Bridges

Sealed tenders will be received up to 3.00 o'clock, standard time,

Wednesday, May 30th, 1923,

for the following named works:-

(a) A reinforced concrete beam of **2-40** ft. spans north of Gravelbourg.
(b) A reinforced concrete **70** ft. suspended arch at Chamberlain.
(c) A reinforced concrete **60** ft. suspended arch north of Kinley.

The contracts will be let separately for the individual works.

Tenders on these works may be mailed under one cover, but tenders for each separate work must be accompanied by an accepted cheque or Guaranty Company's bond for the amount of $250.00. Deposits of unsuccessful tenderers will be returned when the contracts are awarded.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister, Department of Highways.

Plans, specifications, forms of tender and all information may be obtained on application to the undersigned.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Government of Saskatchewan.

Regina, May 7th, 1923. 20

ESTIMATOR—Open for engagement; Scotch trained; twenty years experience. Box 245 Contract Record, Toronto. 18-21

SUPERINTENDENT of construction completing half a million job open for position by 1st of June. Best references. Go anywhere. Box 253, Contract Record, Toronto. 19-21

Tenders for Highway Construction

Separate sealed tenders marked "Tender for Contract No. ......" will be received by the undersigned until 12 o'clock noon on

Wednesday, May 23rd, 1923,

for the following work on the County Roads in the United Counties of Stormont, Dundas and Glengarry.

Second letting of contracts to comprise three macadam, and one culvert contract in the Townships of Kenyon, Lochiel and Lancaster.

Plans, specifications and information to bidders may be seen and tender forms obtained on and after May 17th, 1923 at the office of the undersigned.

A marked cheque for 10% of the tendered price, payable to the Treasurer of the United Counties of Stormont, Dundas and Glengarry, or a Guaranty Company's bid bond for a similar amount must be attached to each tender. A Guaranty Company's Contract bond for 50% of the amount of the tender, or a cash deposit of 10%, shall be furnished by the Contractor when the contract is signed.

The lowest or any tender not necessarily accepted.

County Buildings, Cornwall, Ont.,
May 11th, 1923.

J. G. CAMERON,
County Engineer.

20

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 5, Section C, subsection (b)" will be received by the undersigned until eleven a.m. standard time on

Wednesday, June 6th, 1923,

for the excavation of approximately 76,500 cubic yards of earth and other work required in the construction of Provincial highway from the North-east corner of Section 26, township 30, range 5, West of the 2nd Meridian to Buchanan (12 miles).

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:-
W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.; Albert Hermanson, M.L.A. Sec-Treas. R.M. No. 304, Buchanan, Sask.

An accepted cheque for the sum of $1,000.00 payable to the Deputy Minister of Highways, or a Guaranty Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of 3 p.m. standard time, Wednesday, June 6th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways, Regina, Sask.
May 16th, 1923. 20

STEEL PILING

Bought and Sold

Universal Equipment Company
Niagara Falls. 11-T-f.

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 29, Section E," will be received by the undersigned until eleven a.m. standard time on

Wednesday, June 6th, 1923,

for the excavation of approximately 63,500 cubic yards of earth and other work required in the construction of Provincial highway from Battleford South-west 13 miles.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:-
W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.;

An accepted cheque for the sum of $1,200.00 payable to the Deputy Minister of Highways, or a Guaranty Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of 3 p.m. standard time, Wednesday, June 6th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways, Regina, Sask.
May 16th, 1923. 20

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 18, Section 1, will be received by the undersigned until eleven a.m. standard time on

Wednesday, June 6th, 1923,

for the excavation of approximately 25,500 cubic yards of earth and other work required in the construction of Provincial highway South from Radville, East of Sections 1, 12, 13 and 24 and S.E.¼ 25, township 5, range 18, West 2nd Meridian and East of Section 36, township 4, range 18, West 2nd Meridian (5½ miles).

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:-
W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.; J. A. Saindon, Sec-Treas. R.M. No. 38, Radville, Sask.

An accepted cheque for the sum of $700.00 payable to the Deputy Minister of Highways, or a Guaranty Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of 3 p.m. standard time, Wednesday, June 6th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways, Regina, Sask.
May 16th, 1923. 20

Tenders for School

Tenders will be received by the Separate School Board of Toronto for the erection of an 8 roomed school on Shaw St., Toronto.

Plans and specifications may be seen at the office of the architect, J. P. Hynes, 73 King St. West, Toronto, from May 21st to June 4th, 1923.

Tenders close at **5 P.M. June 4th, 1923,** at the office of the Board, 477 Jarvis St., Toronto.

The lowest or any tender not necessarily accepted.

(Signed) E. S. HENDERSON,
Business Agent for the Board.
May 15th, 1923 20-22

The Toronto Transportation Commission

TENDERS

Sealed tenders will be received for the machinery and equipment required for the General Repair Shops, Bathurst St. and Davenport Road, consisting of Lathes, Drills, Shapers, Milling Machines, Grinders, Furnaces, Forges, Hoists, Air Hammers, Lift Trucks, Time Clocks, Jib Cranes, Car Hoists, etc.

All tenders are to be endorsed "Tender for Machinery and Equipment, General Repair Shops", and are to be addressed to "The Chairman, The Toronto Transportation Commission", and must be delivered at the offices of the Commission, 35 Yonge St., not later than twelve noon, on

Thursday, May 31st, 1923,

All tenders must be on the Commission's form of tender and must be accompanied by complete description, drawings, or photographs of the article tendered on.

Specifications, form of tender and instructions to tenderers, may be obtained upon application to the Commission's Buildings Department, third floor, 35 Yonge Street.

The lowest or any tender not necessarily accepted.

(Signed) H. H. COUZENS,
General Manager.
20 The Toronto Transportation Commission.

WANTED

Steel Forms for concrete pavement. State price and where same may be seen. Box 265, Contract Record, Toronto. 20

To Rent

Steam Road Roller, First Class Shape. The T. Sidney Kirby Co. Limited, 213 Sussex St., Ottawa. 16-T.f.

WANTED

Pump, suitable for 2½ mile Pipe Line on Concrete Pavement job, also quantity of 1½" and 2½" Pipe. State price, particulars and where same may be seen. Box 266, Contract Record, Toronto. 20

Concrete Mixer for Sale

One Concrete Mixer, ½ yard capacity, loading hopper, steam power, made by London Concrete Machinery Company. Good condition, $900.00 Price new over $2,200.00.

THE LABERGE LUMBER CO. LTD.,
19-21 Sudbury, Ont.

WANTED position as foreman or superintendent on construction work, on sewers, tunnels, watermains, pavements, sidewalks, macadam roads. A1. I have recommendation if needed. All kinds of construction work. Box 193, Walkerville P.O., Ontario. 18-21

Some One Wants to Buy

The equipment or machinery that you are not using.

It may be occupying valuable space in your yard or shop, collecting dust, rust and hard knocks.

Sell it before "Depreciation" scraps it.

Use the Tender & For Sale Department. It helps others, let it help you.

FOR SALE

Fire Proof Vault Doors

We have for immediate delivery 50 vault doors clear opening 30" x 78" built special for 17" wall, instead of 20" wall which is our standard. We will dispose of all or part of these doors at a very reasonable price in order to sell them at once.

DOMINION SAFE & VAULT CO. LTD.,
18-20 Niagara Falls, Ont.

FOR SALE

STEEL PLATES—STRUCTURAL GRADE

1—58″ x ⅜″ x 8′ 0″ long
1—60″ x ⅜″ x 6′ 6″ "
1—60″ x ⅜″ x 9′ 7″ "
1—60″ x ⅜″ x 27′ 0″ "
1—72″ x ⅜″ x 8′ 0″ "
1—72″ x ⅜″ x 17′ 0″ "
1—48″ x ⅝″ x 20′ 0″ "
1—60″ x ⅝″ x 7′ 9″ "
1—60″ x ⅝″ x 32· 6″ "
3—60″ x ⅝″ x 40′ 0″ "

The above List of Plates weighs about 15 tons.

This is New Stock, although rust colored from lying in our Stockyard.

In addition we have some Narrow Plates, and a quantity of Angles, Tees, Zees and Bars. Send for a complete List and Price if you are interested.

Mill deliveries are slow; here is an opportunity to secure steel quickly.

THE MARITIME BRIDGE CO. LTD.,
20 New Glasgow, N.S.

For Sale

New and Second Hand Rock Crushers, Steam and Gasoline Rollers, Portable Steam Engines, Dump Wagons, Etc.

Also

Repairs for Crushers, etc.

J. B. DORE & FILS,
18-21 Laprairie, P. Que.

CONTRACTOR'S SUPERINTENDENT, just disengaged, requires position, life-long experience, well up in all classes construction, quantities and estimating, excellent references. Box 224, Contract Record, Toronto. 20

GENERAL CONSTRUCTION SUPERINTENDENT wants job. Thoroughly practical with twenty years experience. Last job Quarter of a Million. A1 references. Go anywhere. Box 231, Contract Record, Toronto. 17-20

Public Buildings, Churches and Schools

(Continued from page 55)

new Masonic Temple at Sherbrooke costing $29,000. H. G. James, Sherbrooke, prepared the plans for this building.

Three Rivers, Que. . . .

A. Dube & Cie., Ltee., have the general contract for a school at Three Rivers, brick, three storeys high, 85 ft. x 40 ft., at $38,586. The plumbing and heating contracts have been awarded to H. Massicotte & Freres Ltd., Cap de Madeleine at $8,925.

Business Buildings and Industrial Plants

Duncan, B. C.

A telephone exchange at Duncan is contemplated by the British Columbia Telephone Co., Vancouver. The building will be constructed of pressed brick with concrete foundations. M. A. Kinch, is in charge for the Company at Duncan.

Edmonton, Ont.

Carter, Halls, Aldinger & Co., Edmonton, have the general contract for an extension of frame construction, 240 ft. x 20 ft., to the Edmonton Stockyards, This structure will cost $25,000.

Hamilton, Ont.

E. Robinson, 168 Tragina Ave., is building a factory, one storey high, 30 ft. x 60 ft., concrete block construction.

Kitchener, Ont.

A site has been purchased for an exchange by the Bell Telephone Co., Adelaide St., West, Toronto, and W. J. Carmichael, architect, is preparing plans for the building.

London, Ont.

Watt & Blackwell, Bank of Toronto Bldg., will receive tenders on a one storey office building of concrete, hollow tile and brick construction, for Wm. Martin Coal Co. This building will cost $10,000.

Montreal, Que.

Omer Caron, 464 Lasalle St., has applied to the City for permission to build a public garage at the corner of Lasalle and Ontario Sts. A Patenaude, 895 Henri Julien St., has also applied for permission to build a public garage at Nos. 48-54 Savoie St.

A $12,000 garage, concrete, brick and frame construction, two storeys high, 22 ft. x 20 ft., will be built for F. X. Gagnon 382 Marguette St., by A. Roberg, 786 Garnier St.

Quebec, Que.

Members of the Board of Trade are discussing the erection of a $500,000 cold storage plant and it is expected that the Federal Government will make a loan of this amount for the construction of this building. Gerard Power, Chairman of the Harbor Commission is interested in this project.

Toronto, Ont.

Kilgour Bros., 21 Wellington St. W., Toronto, will call for tenders shortly for a two storey factory, 90 ft. x 120 ft., of brick construction, to be built at Windsor Mills, Que.

Vernon, B. C.

[illegible] will be erected by the [illegible] Oil Co. in Vernon. The buildings will include a new storage warehouse, two large and two small steel tanks and an office building and service station. Work will start at once and buildings will be principally of frame construction except the warehouse which will be concrete.

Weston, Ont.

N. J. Seal, H. Cousins and W. F. Griffiths, all of Weston, are interested in the building of a theatre with a seating capacity of [illegible] at a cost of $25,000. The architect has not yet been appointed.

CONTRACTS AWARDED

Mission, B. C.

Pacific Berry Growers' Ltd., Mission have awarded the general contract for a two storey, 40 ft. x 45 ft., pre-cooling plant of frame and mill construction to the Linde Canadian Refrigeration Co. Ltd., 500 Campbell Ave., Vancouver.

Montreal, Que.

Two stores and four flats will be erected by Phillip Girard, 112 Drolet St., and contracts for roofing, electrical work heating, plastering, etc., will be let.

Church Ross Co. Ltd., 10 Cathcart St., will build a one storey factory, 40 ft. x 50 ft., concrete foundation, brick construction, for Dominion Oilcloth & Linoleum Co. Ltd., 1192 St. Catherine St., at a cost of $20,000.

U. Savageau, 108 Adam St., is excavating for stores and flats for M. Elkin, 32 Windsor St. General contractor buys all material and buildings will cost [illegible].

Ste. Therese, Que.

E. Thibault, Ste. Therese, is building a store, two storeys high, 34 ft. x 42 ft., brick and concrete construction, for Z. Laroche, at a cost of $8,000.

Toronto, Ont.

Douglas Bros., 124 Adelaide St. West, have the roofing contract for the addition to the Bay St. sub-station, for the Toronto Electric Commission. E. J. Curry, 146 King St. west has the plastering contract. Jas. Wickett Ltd., 16 Saulter St., has the general contract.

Residences

Charlottetown, P. E. I.

Subtrades are not yet let for a $10,000, two storey dwelling, being built by H. & S. Lowe, 240 Hillsboro St., for Mrs. J. Richardson, Bideford, P. E. I.

Hamilton, Ont.

Sparks & McKay, 130 Sherman Ave., are excavating for a two storey brick residence costing $15,000.

Huntsville, Ont.

William Mayhew will build a brick and concrete residence costing $10,000.

Montreal, Que.

Tenders for an apartment house containing eleven suites and costing $25,000 are being received by S. Frappier, architect, 2338 Park Ave. Structure will be four storeys high, 40 ft. x 50 ft., solid brick construction.

L. P. Forest, 347 St. Joseph Blvd., will buy all materials and let all subtrades for an apartment house on Park Ave., near Fairmont St., costing $50,000.

A. Aymot, 475 Valois St., will build two three storey brick residences with concrete foundations at a cost of $16,000. Roofing, electrical, plumbing, brickwork and plastering contracts will be let.

Three residences costing $20,000 will be built by A. Lamontagne, 1726 Cartier St. These houses will have concrete foundations and will be of frame and brick construction. Sub-trades will be let.

Outremont, Que.

H. Dansereau, 401 Stuart Ave., has excavated for an apartment house, four storeys high, 50 ft. x 125 ft., concrete, brick and stone construction. Contracts for roofing, electrical work, plumbing, heating, plastering, ornamental iron, fire escapes, etc., will bet let. Materials for this building will be purchased by the owner.

Welder Bermingham Realty Co., Bleury St., Montreal, propose to build fifty semi-detached cottages, costing $18,000 each.

J. Gersovitz, 1117 St. Urbain St., will build an apartment house costing $75,000 and has not yet purchased necessary materials. Contracts for steel, roofing, electrical work, plumbing, heating, plastering, etc., will bet let.

Richibucto, N. B.

R. A. Frechette, 30 Bonnacord St., Moncton, is preparing plans for a frame residence for Senator T. J. Bourque, Richibucto, to cost $10,000. No materials have been purchased for this work.

Toronto, Ont.

Tenders for heating, plumbing, plastering, electrical work, etc., for an apartment house costing $20,000 will be let by A. Gardie, 633 Bathurst St.

Daniel C. Kay, builder, has purchased land on Austin Terrace on which he intends to build several houses costing between $15,000 and $20,000.

L. G. Bridgeman, Bank of Commerce Bldg., London, is preparing plans for a two storey residence, 32 ft. x 45 ft., concrete and brick construction, costing $20,000.

Tenders will be called about May 30 for a two storey residence for J. E. Ganong, 57 Glen Road, costing $30,000. Mathers & Haldenby, Manning Chambers, architects.

Tenders on all trades for an apartment house costing $15,000 will be let by W. T. Bennett, 51 Rose Park Drive, owner. The building will be three storeys high, brick and stone construction, with hot water heating and five sets of plumbing.

H. Addison Johnston, 412 Lakefront, is understood to be negotiating for a 900 foot frontage on Leslie Gardens in connection with his $1,000,000 housing program. Since April 1 thirty-four dwellings have been erected and twenty-six roofed. The scheme calls for two hundred residences.

Plans are being prepared for three residences costing $15,000 each by Harold Watson, Excelsior Life Bldg., for A. H. Paffard. Work on these buildings, which will be two storeys high, brick and hollow tile construction, will commence about June 1.

CONTRACTS AWARDED

Outremont, Que.

Gilletz & Co., 1188 City Hall Ave., have the general contract for a cottage for D. S. Eidlow, 754 St. Urbain St., costing $25,000. Contracts for roofing, wiring, heating, plastering, tiling, etc., will be let. Materials for this house have not yet been purchased.

Toronto, Ont.

Steel sash for a $20,000 apartment house for M. Pifko, c/o Kaplan & Sprachmann, 298 Dundas St. West, will be supplied by the Canadian Metal Window & Steel Products, River St. Dominion Sewer Pipe Co., Swansea, will supply the face brick.

Power Plants Electricity and Telephones

Cobalt, Ont.

Ten mining companies are negotiating for power with the Great Northern Power Co. which is developing power on the Montreal River at Indian Chutes and two other falls.

Fredericton, N. B.

Premier P. J. Venoit in a recent speech in the New Brunswick Legislature spoke in favor of an amendment to the New Brunswick Electric Power Act, authorizing the issue of an additional $1,000,000 of debentures, which is the initial amount needed to proceed with the development of Grand Falls.

Montreal, Que.

Letters patent have been granted to the Montreal Island Power Co. Ltd. to operate in Montreal and the immediate districts. The charter provides for powers to build dams and to construct and operate various means of developing and distributing light, heat, power and any other energy. The company is capitalized at $1,375,000.

Musquash, N. B.

New Brunswick Electric Power Commission, 65 Prince William st., St. John, is receiving tenders for repairs to dams, damaged b yrecent floods. Musquash West storage dam and Musquash dam are included in this work, estimated to cost 100,000.

Nelson, B. C.

Winston Bros. Co., Minneapolis, Minn, have announced that they will begin work at once on the Elko River development plant tunnell.

Orangeville, Ont.

The Cataract Electric Company, Orangeville, a subsidiary of Engineering and Radio Supplies, Ltd., will extend the capacity of their hydro-electric plant from the present value of 800 h.p. to about 3000 h.p. Plans are at present being prepared.

Ottawa, Ont.

Tenders are being called by the Canadian Government on a large number of used motors of various sizes. This equipment, formerly used at Camp Borden, is now no longer required.

Outremont, Que.

H. Dansereau, 401 Stuart St., has not yet purchased the domestic telephone

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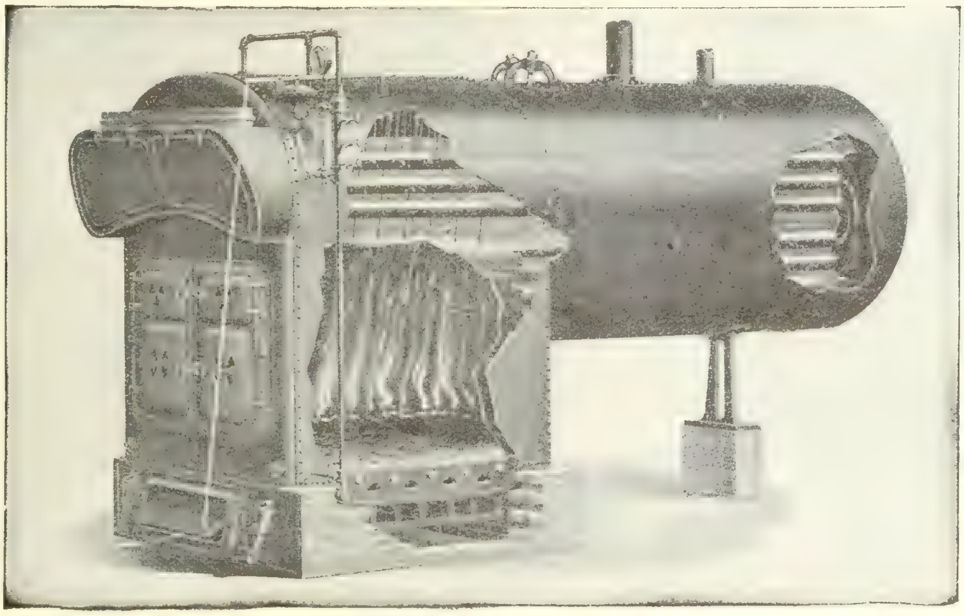

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Montreal Sales Office—385 Beaver Hall Square

tenders for an apartment house costing [illegible]

St. Adolphe-de-Champlain, Que.
Permission has been granted the Electric Service Corpn., Shawinigan Falls, Que., to build a plant and supply St. Adolphe-de-Champlain with power for a period of ten years. The work must be completed by July 1, 1923. John Bourque, Shawinigan Falls, supervisor.

St. Johns, Nfld.
Sir Richard Squires, leader of the Liberal party in Newfoundland, has issued a manifesto appealing to the country for a mandate in the general election to bring about a proposed water power development at Humbermouth.

Three Rivers, Jue.
Premier Taschereau in a speech at Three Rivers issued an invitation to the railways to get in touch with the Government with a view to securing power if they wished to electrify their lines.

Toronto, Ont.
The Hydro-electric Power Commission of the Province of Ontario is calling for tenders for the construction of Power House foundations and Trail race excavations for power development at Dam No. 8, Trent River, Ont.

Vancouver, B. C.
The B. C. Electric Railway Co. has awarded contracts for clearing the 28 mile right-of-way from Britannia Beach to West Vancouver.

Vernon, B. C.
The municipality of Coldstream recently enquired whether Vernon Council would consider supplying light and power to residents at the lower end of Coldstream.

Walkerville, Ont.
Walkerville Council has decided to guarantee 106,000 worth of bonds as Walkerville's share toward the Hydro Railway development in the Border Cities this year.

Warkworth, Ont.
A transmission line will be built from Bardley's Corners to Warkworth this summer in order to supply the village with power. The contract with the Hydro Commission to this effect has been signed.

CONTRACTS AWARDED

Hagersville, Ont.
Sage Electric Co., Cross st., Welland, have secured the contract to instal 20 motors in the quarry of Hagersville Quarries, Ltd., Hagersville.

Kingston, Ont.
Hary Alexander" Ltd., Toronto, is wiring the $300,000 library at Queens University.

Port Hope, Ont.
Bennett & Wright, Toronto, have been awarded the contract for wiring the new junior school at Trinity College.

Miscellaneous

Ailsa Craig, Ont.
Ailsa Craig, Lucan and Parkhill may purchase a high-pressure motor pump, jointly, as a protection against further conflagrations.

Brighton, Ont.
Dodds' Canadian Iron Works Ltd., Welland, may locate in Brighton. Brighton Board of Trade and Mr. Dodds, representing the company recently held a conference relative to this project.

Curry's Cove, N. B.
The Dominion Government will receive tenders for dredging until May 25. R. C. Desrochers, Ottawa, has specifications, also Offices of District Engineers, Bellvue Bldg., Halifax, N. S., and the Custom House, St. John, N. B.

Guelph, Ont.
At a meeting of the committee appointed to consider plans for a soldiers' memorial, it was decided to take photographs of Trafalgar Sq. and have blue prints made of it showing all features. The memorial will cost $25,000.

Kingston, Ont.
Letters patent have been issued incorporating the Canadian Non-Exhaust Pneumatic Machine Co. Ltd., with a capital of $750,000. The charter empowers the company to manufacture, machinery, boilers, compressors, pumps, rock drills, etc. The head office will be at Kingston.

Levis, Que.
Letters patent have been granted to the National Dock and Dredging Corpn. Ltd., to operate throughout the Dominion. The Capital of the company is $95,000 and head office will be in Levis.

Montreal, Que.
H. A. Terreault, Director of Public Works, will receive tenders until May 19 for a 10-ton tandem steam roller.

Prices on 30,000 plastic, Roman and red pressed brick, together with concrete blocks and all other materials for three flats, costing $14,000, are wanted by B. Kaplan, 1016 St. Urban St.

Stewart & Hurst Construction Co., capital $99,000, has been granted a Provincial Charter to operate as builders, engineers and contractors. Head offices will be in Montreal.

Sorel Sand Co. Ltd., dealers in sand, gravel, stone and wood and general contractors for buildings, roads power plants, etc., have been granted a Provincial Charter and will operate from St. Joseph-de-Sorel, in the district of Richelieu, Que.

Pictou Island, N. S.
Tenders for dredging are being received by the Dominion Government, R. C. Desrochers, Ottawa, secretary, until May 25. Specifications at Department of Public Works, Ottawa, District Engineers' Office, Halifax, N. S., and Custom House, St. John, N. B.

Shawinigan Falls, Ont.
Quotations for a carload of filter soda ash and a carload of alum are invited by J. H. Valiquette, City Manager, City Hall.

Three Rivers, Que.
A kiln and heating system costing $75,000, for St. Joseph Hospital, is contemplated by the Sisters de la Province. Asselin & Denoncourt, architects, 42 Alexander St., will call tenders.

Toronto, Ont.
Copper roofing for the clock-tower of the City Hall is contemplated by the City and work will probably proceed shortly.

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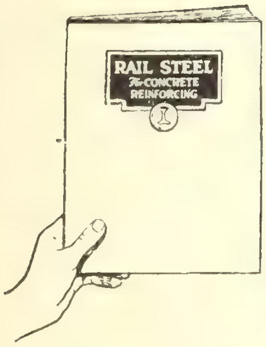
You, as an architect, engineer, contractor or user of reinforcing bars in any form, are entitled to some valuable information about Rail Steel Bars which has not heretofore been published. Facts relating to the manufacture, qualities and use of these bars have been published in a volume entitled "Rail Steel for Concrete Reinforcing" a copy of which we will gladly send you upon request.



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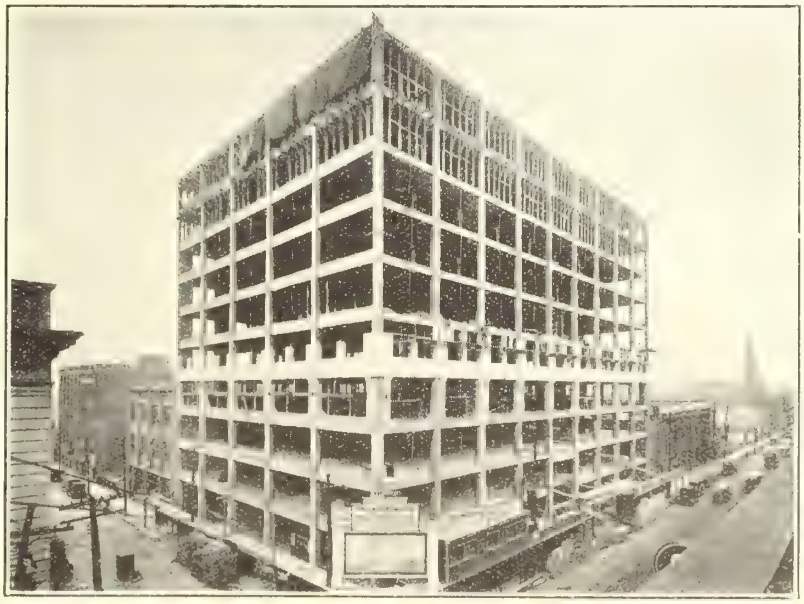

Burlington Reinforcing Bars used in construction of new Federal Office Building, Toronto, erected 1922.

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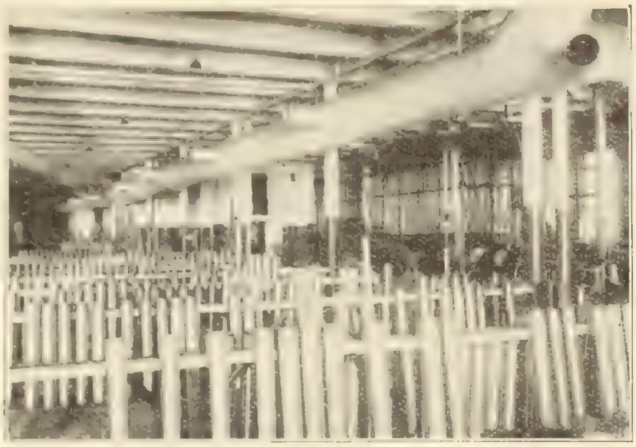

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Late News

Birchcliffe, Ont.

Scarboro Township Council has passed by-laws authorizing the layout of about 12 miles of new sidewalks and roadways in various sections of the township at a cost of $50,000.

London, Ont.

Watt & Blackwell, Bank of Toronto Bldg., are preparing plans for a parish hall for Cronyn Memorial Church.

Montreal, Que.

Federal Construction Co., 329 Ontario St., propose to erect an office building and warehouse costing $500,000. Structure will be 10 storeys high, 125 ft. x 80 ft.

Port Arthur, Ont.

A second transmission line from Cameron Falls to Port Arthur will probably be constructed during the coming summer by the Hydro-electric Power Commission of Ontario. The plant capacity at Cameron Falls will be increased by either one or two 10,000 horsepower units.

Quebec, Que.

A despatch from Quebec states that the Quebec Development Co. will dispose of its power wholesale to other concerns which will distribute it. It is also reported that as soon as the power is available that it may be expected that the Quebec-Montreal sections of railway lines in the province will be electrified. The C.N.R. lines between Quebec and Chicoutimi, Montreal and Chicoutimi via Riviere a Pierre and a section of the trans-continental might also benefit.

Shawinigan Water Power Company has purchased the controlling interest in the Quebec Railway, Light, Heat and Power Company and propose to expend a substantial sum on the railway, the light and power division and the gas department, in order to adequately provide for additional business.

Saskatoon Sask.

The construction of a water purifying plant is contemplated by the city. A. Leslie, City Commissioner.

Thessalon, Ont.

Tenders will be called about June 1 for a High School building costing $39,000. T. Wilks, 612 Queen St., east, Sault Ste. Marie, architect.

Toronto, Ont.

The construction of a Measles Hospital, near the Isolation Hospital is contemplated by the city. The Board of Health has recommended that this building be built.

Vancouver, B. C.

D. B. Griffin, 739 Hastings Ave., has the general contract for building 12 miles of new road along the Columbia River for the Provincial Government at a cost of $48,000.

Weston, Ont.

The Council has decided to expend $26,900 for new watermains in various sub-divisions. This work will be done on the local improvement plan. At a cost of $3,000 a chlorinating plant will be added to the present water system.

Winnipeg, Man.

John Inglis & Co., Toronto, have been awarded the contract for the supplying of three boilers complete with the necessary supporting steel by the City of Winnipeg at $64,145.

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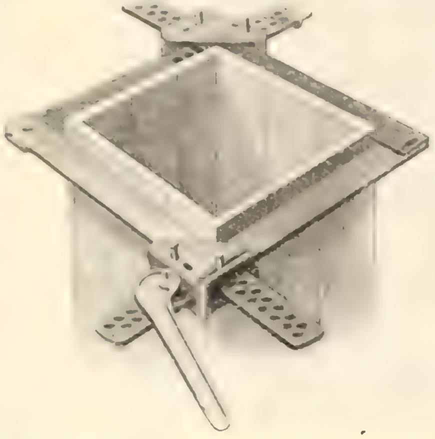

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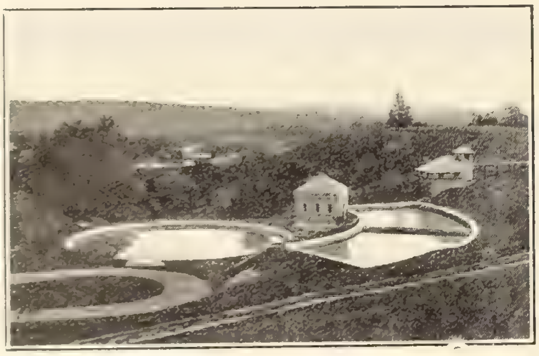

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Here's Real News

The Hydro Electric Power Commissioners of Ontario
have appointed a Sales Syndicate
to advantageously liquidate all the

Equipment and Supplies

which can be released from the

Queenston-Chippawa Development

The majority of this Equipment—recently released—was purchased new and used only on the above undertaking. This is a splendid opportunity to secure really high grade, modern Machinery-Accessories and Supplies at prices that are right.

Our amended Stock List is now being prepared and we will be very glad to forward your copy, upon request. Time spent consulting this list will be time well spent. Someone will profit handsomely as those who purchase any of this "special offering" which is available are going to make one of the best purchases in their career.

We give below a general idea of what class of equipment is available.

Steam and Electric Shovels—Steam and Electric Locomotives—Air Dump Cars—Air Compressors—Channellers—Conveyors—Drills—Motors—Concrete Mixers—Concrete Cars and Auxiliary Equipment—Electric and Steam Hoists. In fact—almost everything you might require.

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Current Prices of Building and Engineering Materials

		Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.35
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	11.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	30.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*†	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to 230.00		185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		50.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 “	“ “
Crusher run	per ton	2.20½		3.00 “	“ “
Rubble stone	per ton	2.45	1.70	15.00 cord	“ “
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	“ “
Gravel 1 in. screened	per ton	2.31	1.50	2.75 “	“ “
Sand, screened	per ton	1.42½	1.25	1.90 “	“ “
Pit run	per ton	1.52¾	1.25	1.90 “	“ “
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	4.25 “	3.75 “	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	5.00 “	4.75 “	5.10 base	
Hoops	per 100 lbs.	3.75 “	3.75 “		
Twisted and deformed bars	per 100 lbs.	3.90 “	3.75 “	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	4.00 “	4.00 “	5.35	6.00
Structural shapes	per 100 lbs.	3.50 “	3.75 “	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	4.00 “	4.10 “	5.15	6.25
Plates—3/16 in.	per 100 lbs.	4.40 “	4.50 “	5.55	6.50
Plates—10 gauge	per 100 lbs.	5.50 “	5.10 “	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	6.90	7.00	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 “	7.00 “	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.25 “	6.00 “	7.70	8.25-8.50
Rivets	per 100 lbs.	65.00	60.00	7.00 base	
Cast iron pipe	per ton				
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.28
Sewer pipe, 6 in	per ft.	.60	.45	.45	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

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Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	94.50	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	30.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	130.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	30.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	42/48	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	50/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.50	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	

PAINTS, OILS, COLOURS (delivered):—		Toronto	Montreal	Winnipeg	Vancouver*
White lead ground in oil, less than ton lots	per cwt.	14.55	14.60	15.60	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	5.95	4.25	5.50	9.25
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.28	1.40	1.26	1.28
Raw linseed oil, in bbls.	per gal.	1.25	1.38	1.23	1.25
Turpentine, in bbls.	per gal.	2.25	2.20	2.50	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45

PLASTER (Delivered):—		Toronto	Montreal	Winnipeg	Vancouver*
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	30.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50

LABOR:—		Toronto	Montreal	Winnipeg	Vancouver*
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.25	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers (Common)	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Laborers (Skilled)	per hr.	.60- 70			.90
Sheet Metal Workers	per hr.	.80			

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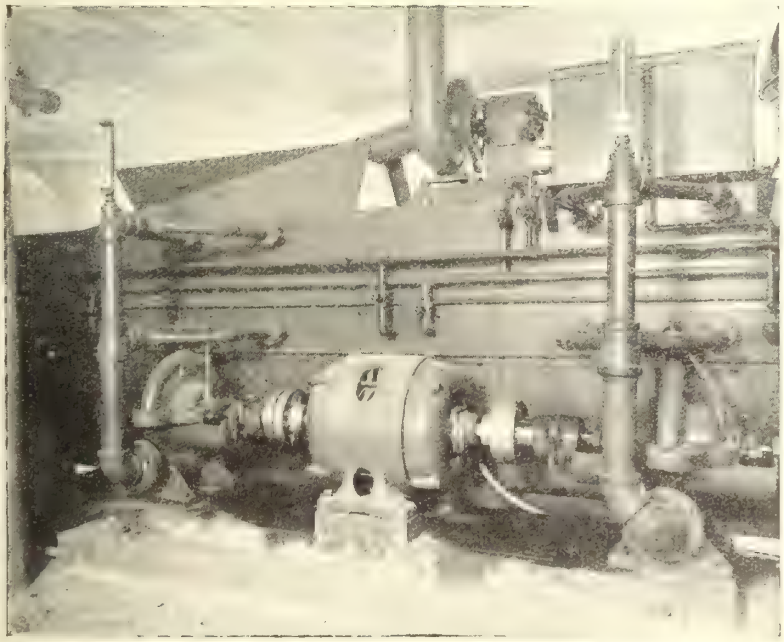

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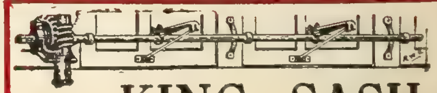

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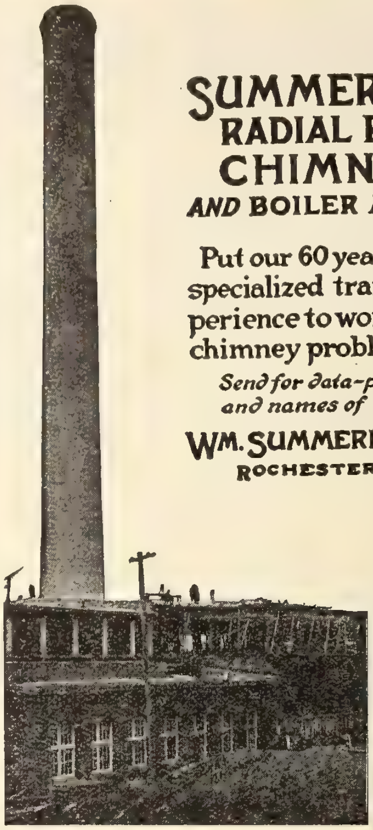

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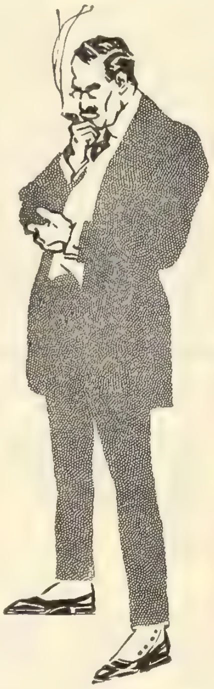

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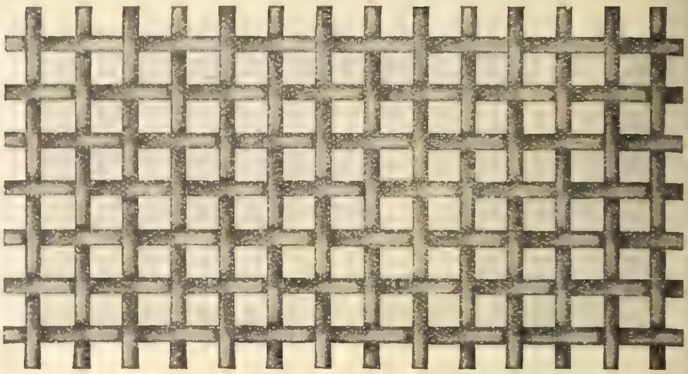

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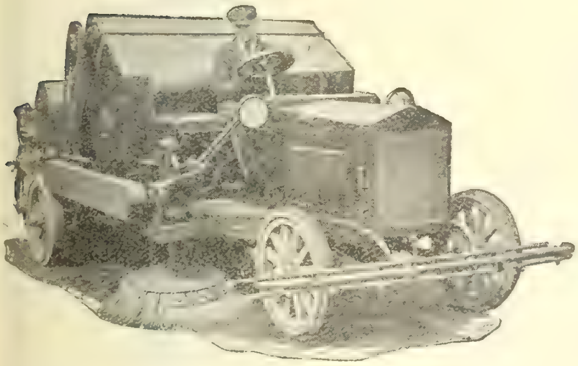

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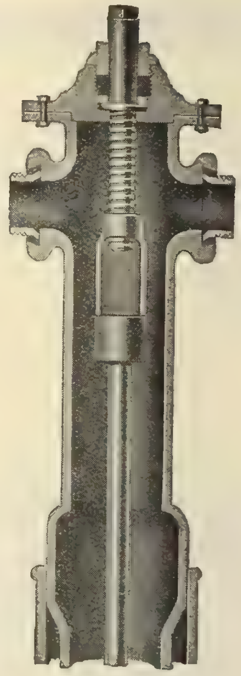

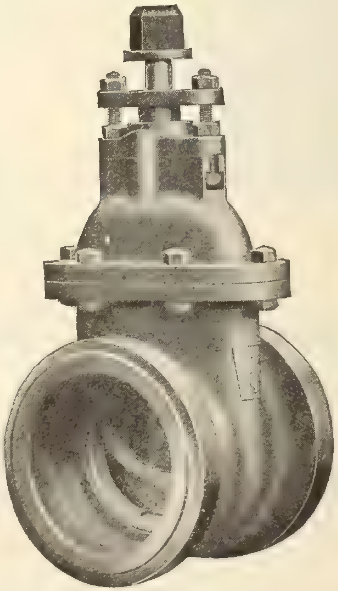

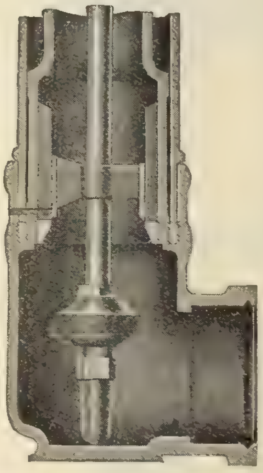

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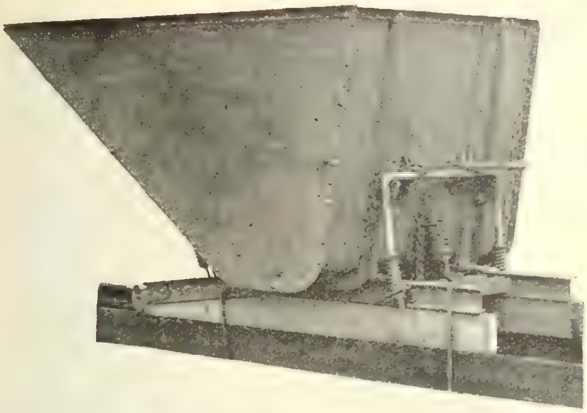

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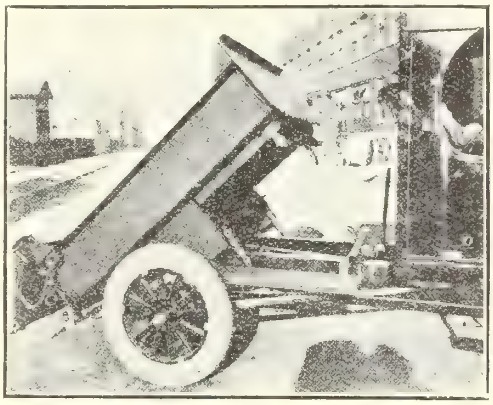

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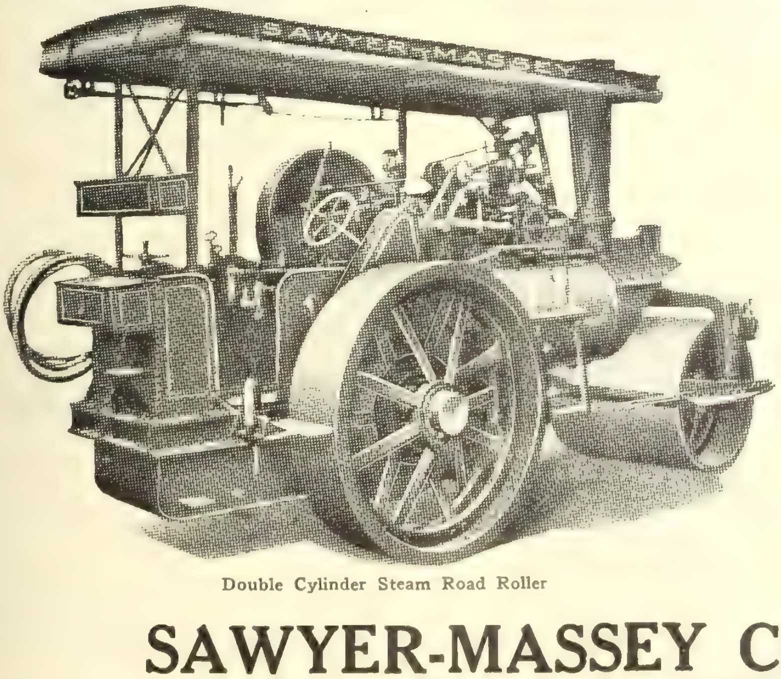

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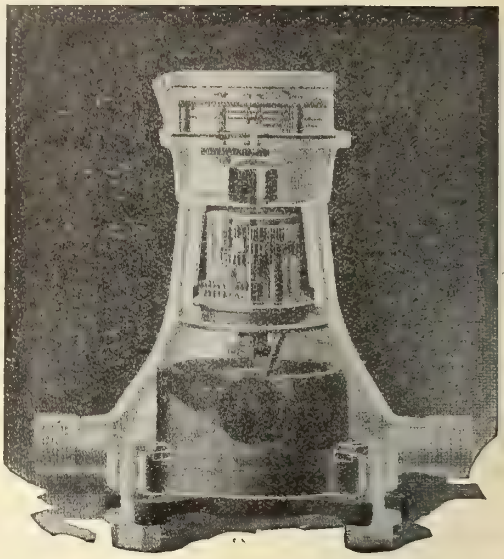

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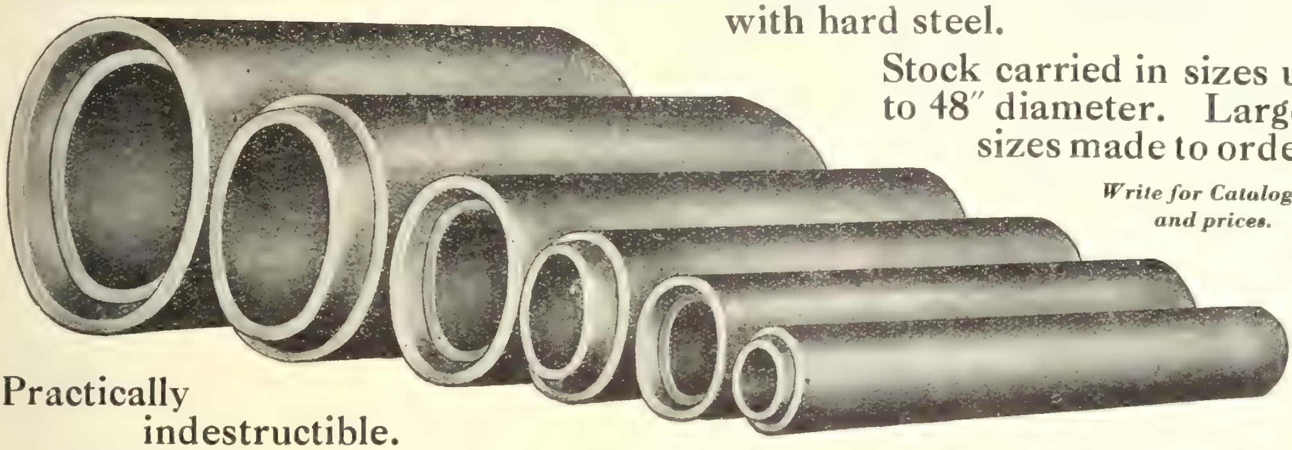

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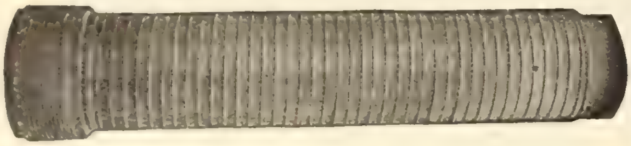

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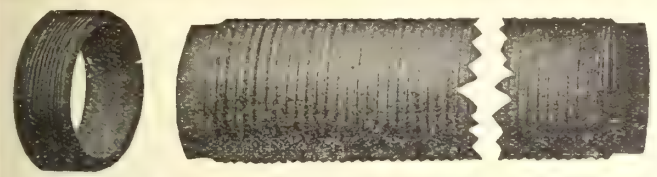

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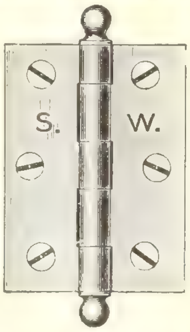

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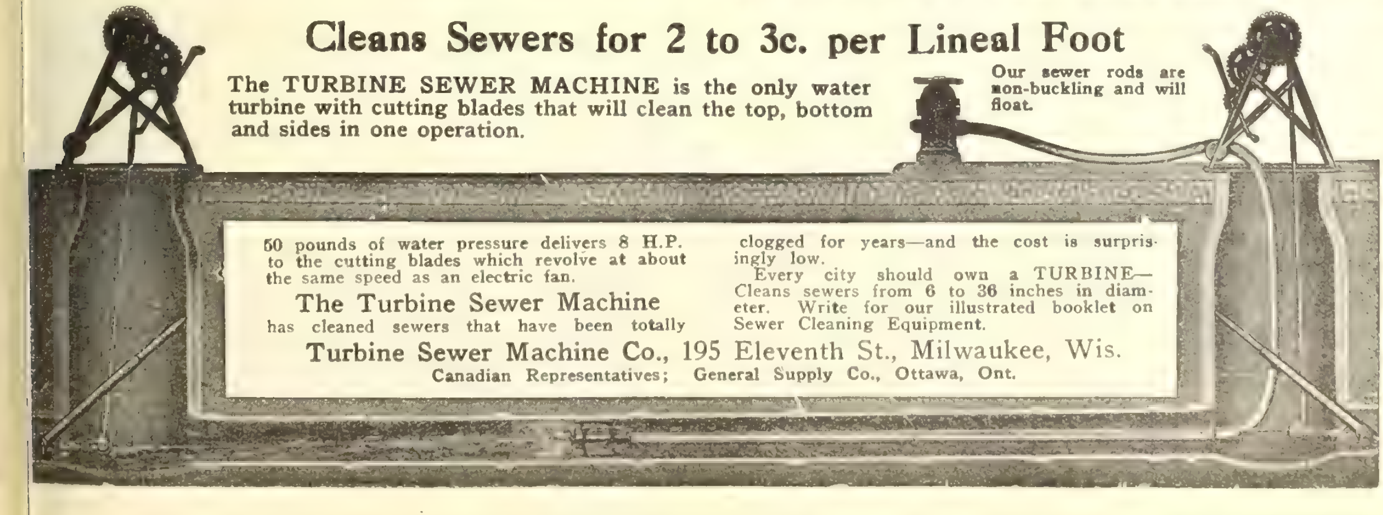

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Section 300

No Boiler which has been in use for two or more seasons shall be sold or exchanged for subsequent use as a Boiler unless it is accompanied by an inspection certificate issued by the Department within one year preceding the date of such sale or exchange. The allowable working pressure for such Boiler shall be determined by the Inspector from the formulæ contained in the regulations, with such deductions in pressure for depreciation as the Inspector's judgment shall dictate.

The travelling expenses in connection with the inspection of Boilers sold, exchanged or extensively repaired, must be paid by the owner or purchaser of such Boilers, together with the inspection fee of five dollars.

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D. M. MEDCALF, Chief Inspector of Steam Boilers.

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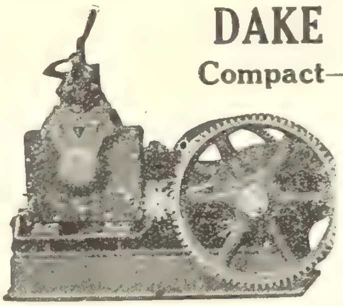

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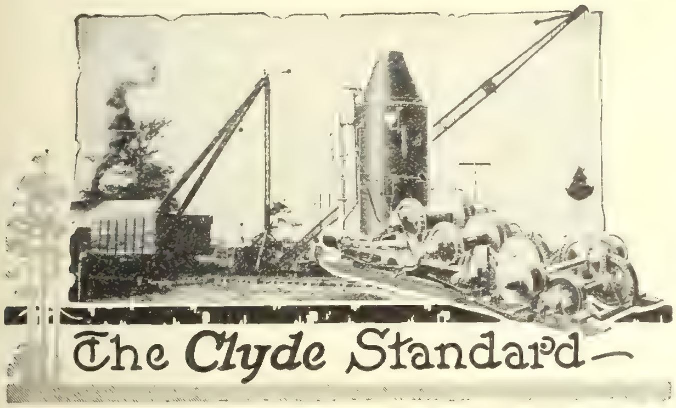
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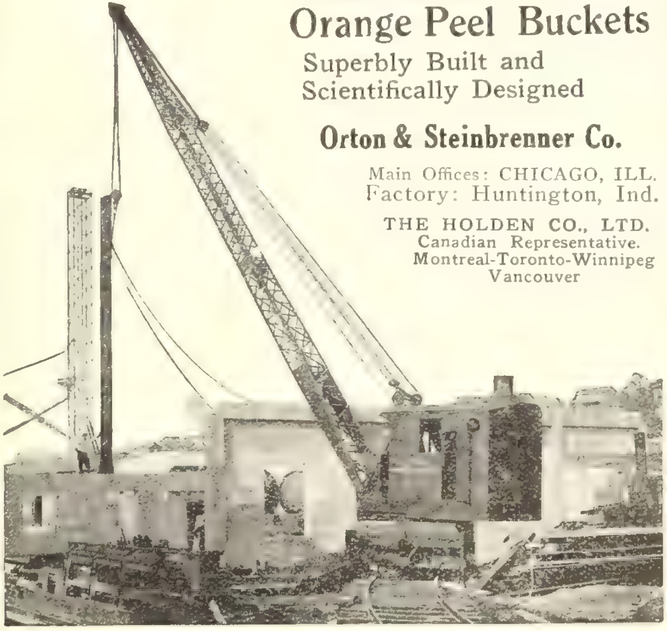

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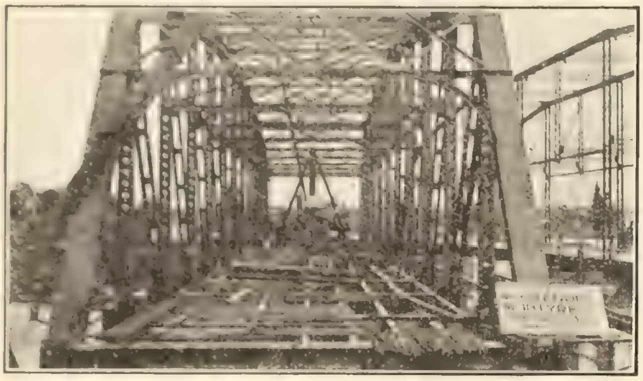

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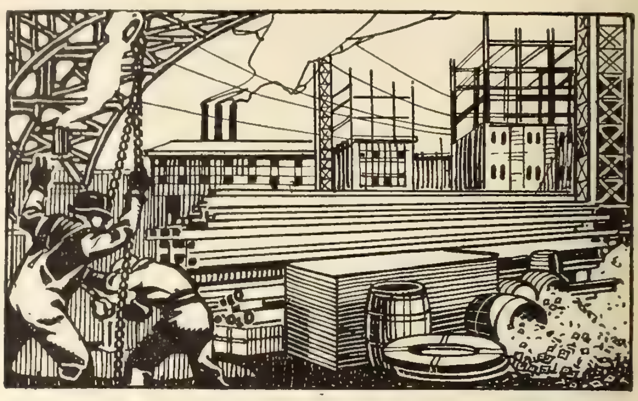

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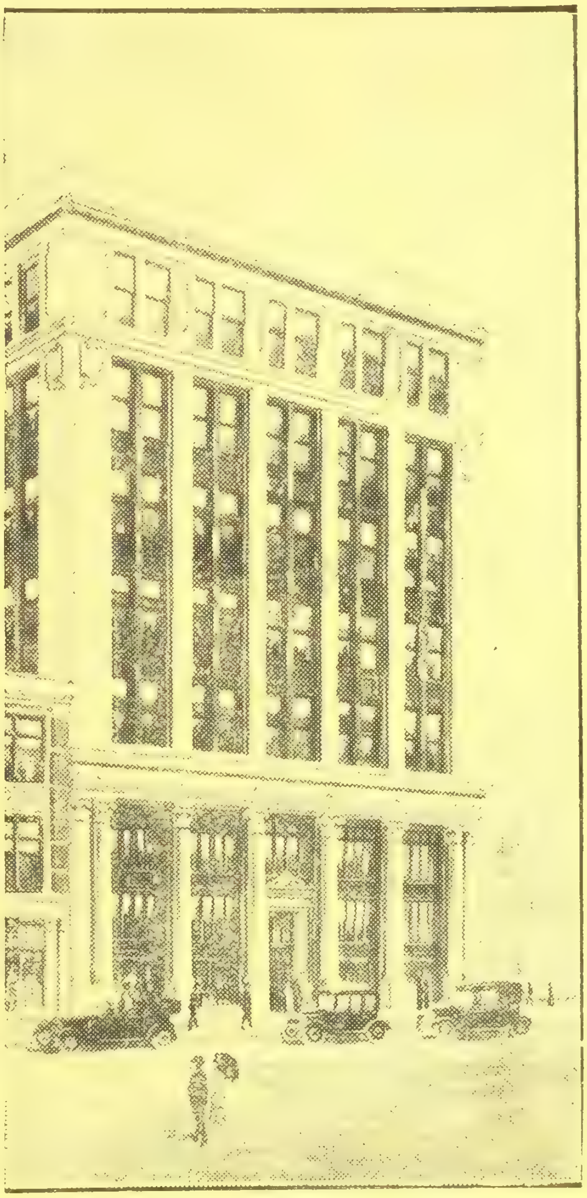

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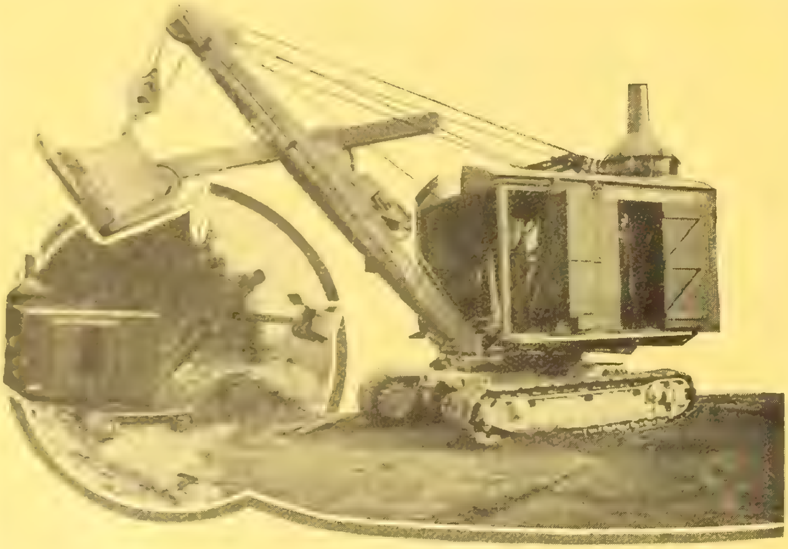

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Vol. 37 Toronto, May 23, 1923 No 21

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16 inches to 14 feet diameter

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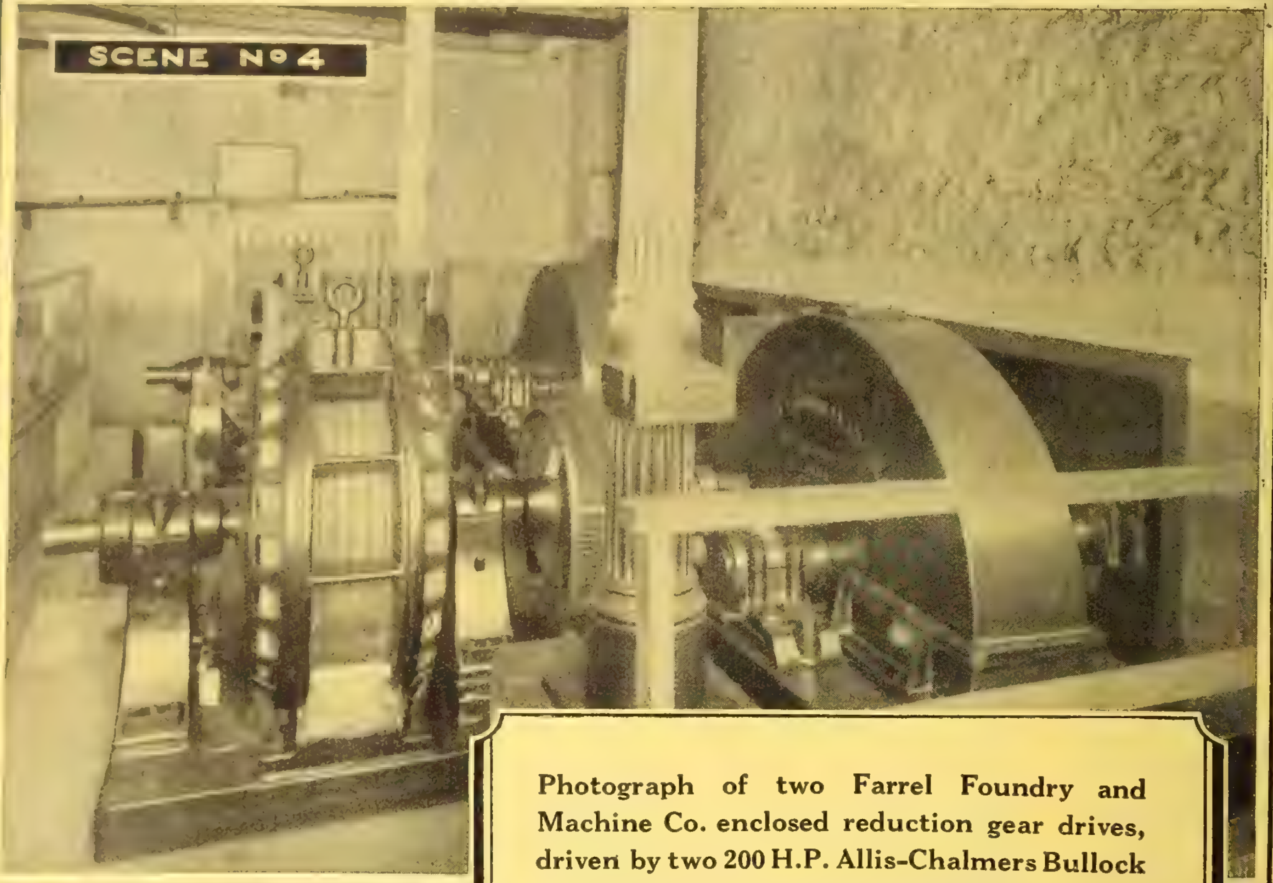

Photograph of two Farrel Foundry and Machine Co. enclosed reduction gear drives, driven by two 200 H.P. Allis-Chalmers Bullock A.C. Motors. Motor Speed 290 R.P.M.

Imperial Lubricants in use:—

Imperial Renown Oil.
Imperial Polarine Transmission Oil.

IMPERIAL
LUBRICANTS

FOR MANUFACTURING, MINING AND MILLING

CYLINDER OILS

Imperial Cylinder Oil
Imperial Valve Oil
Imperial Capitol Cylinder Oil
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Imperial Solar Red Oil
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Imperial Renown Oil
Imperial Bayonne Engine Oil
Imperial Polar Machine Oil
Imperial Ario Compressor Oil
Imperial Turbine Oils
Imperial Eldorado Castor Machine Oil

FOR VARIOUS INDUSTRIAL USES

Imperial Black Oils
Imperial Cutting Oils
Imperial Tempering Oils
Imperial Cordage Oils
Imperial Wool Oils
Imperial Ink Oils
Imperial Greases.

It is not at all unusual for plant operators to report lubrication savings up to 35 per cent. following standardization on Imperial Lubricants. Economies which are immediately evident reflect our exhaustive study of industrial requirements as well as the scientific methods which govern the manufacture of our complete line of industrial oils and greases. Write our nearest branch for information on any lubrication problem. Your letter will be followed up personally by our expert lubrication engineers.

IMPERIAL OIL LIMITED

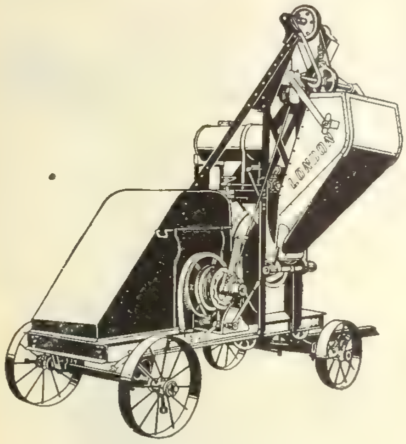

Fig. 33
London Heavy Duty Mixer with Gasoline Power

"WHY"

In these days of keen competition in the building industries the contractor who purchases **LONDON EQUIPMENT** finds himself equipped to do work at the lowest cost.

"BECAUSE"

they are designed to run continually. Breakdowns and repairs put the contractor out of business.

Fig. 19 illustrates the London Concrete Mixers, Nos. 4 and 6. Designed for building culverts, bridges, sidewalks, foundations, silos or any work requiring a portable mixer with a capacity up to 60 cu. yards per day. Described in Bulletin 49-C-D.

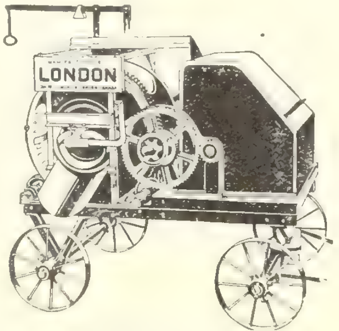

Fig. 19
London Concrete Mixers, Nos. 4 and 6

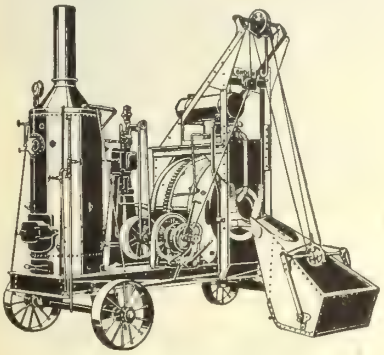

Fig. 39
London Heavy Duty Mixer with Steam Power

Figs. 33 and 39 illustrate the London Heavy Duty Concrete Mixers, built in five sizes and in capacities from 90 to 300 cu. yards per day. Described in Bulletin 49-F-1.

Fig. 814 illustrates the London Gem Concrete Mixers Made in two sizes, Nos. 3 and 5. Especially suitable for small contracts. Capacities up to 50 cu. yards per day. Described in Bulletin A-3.

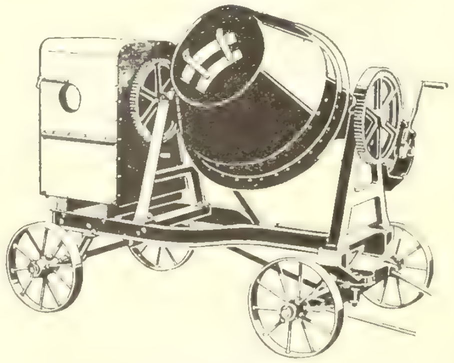

Fig 814
London Gem Concrete Mixers Nos. 3 and 5

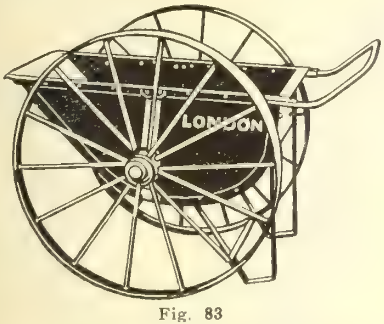

Fig. 83
London Concrete Cart No. 6

Fig. 83 illustrates the London Concrete Cart No. 6. The load is correctly balanced. No weight on the operator's arms. Dumps easy and clean. High grade construction. Described in Bulletin O.

Made in Canada

We manufacture Concrete Mixers, Hoists, Air Compressors, Pumps, Brick, Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

The London Concrete Machinery Co., Limited

Dept. 7 London, Canada

World's Largest Manufacturers of Concrete Machinery

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T. McAvity & Sons, St. John, N.B.
Rene Talbot, Quebec, Que.
O. E. Barnard, Sherbrooke, Que.
R. G. Noll, Hamilton, Ont.

Geo. F. Foss Machy. & Supply Co. Montreal.
Harvard Turnbull & Co., Toronto.
General Supply Co., of Canada, Ottawa and Winnipeg.

E. A. Muir, Port Arthur.
Gorman's Limited, Calgary and Edmonton.
West Kootenay Equipment & Construction Co., Nelson, B.C.
B. C. Equipment Co., Vancouver.

KOEHRING Dragline

All Koehring Built!

KOEHRING draglines are all Koehring-built from the ground to the boom peak — from the foundry through the machine shops to the loading of the flatcars in the erecting shops.

This alone makes possible strict adherence to Koehring Heavy Duty standards in every detail — and when you know the detail of Koehring construction, you will recognize All-Koehring-built as an unusual value in excavating machinery — as an important, additional factor of greater capacity performance, lowest maintenance and longest trouble-free service life.

Koehring Company of Canada, Ltd.

105 Front St. East,
Toronto, Ont.
Phone: Main 1498

616 Canada Cement Bldg.,
Montreal, Quebec
Phone: Uptown 3026

Ottawa Representatives:
E. N. & W. E. Soper, 63 Sparks St., Ottawa, Ont.
Queen 3435

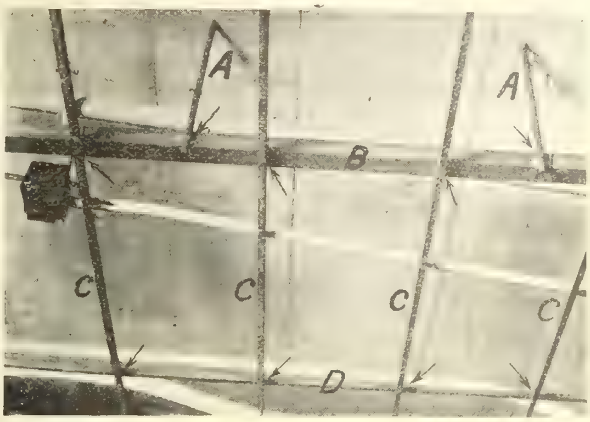
Dragline Capacities

No. 1. ¾ cu. yd. at 30 ft. radius.
No. 2. 1 cu. yd. at 40 ft. radius.
No. 3. 1½ cu. yd. at 40 ft. radius. May be adapted for crane-excavator and shovel.

Write for catalog.

CR 34

KOEHRING HEAVY DUTY



Welding ceiling construction—Arrow indicates points of welding

Electric Arc Welding

has thousands of applications from the construction of steel work carrying suspended ceilings, as shown in the cut, to the manufacture from sheet steel of a multiplicity of articles to supersede costly cast iron.

We have four machines in daily use in our shops in new construction and repairs. No preheating necessary. We repair Boilers, Steam Shovels, Hoisting Engines, Cylinders, etc., etc. Manufacturers of well known Lincoln Motors and Electric Welders.

Lincoln Electric Company of Canada, Limited

136 John St., Toronto

BATES SYSTEM

OF BAR TYING
for
Reinforced Concrete Work

Save 2/3rds the time on concrete reinforcing jobs by using Bates Bar Ties and Tying Tools.

Three turns of the Bates Tool and the Bars are tied.

Write for circular covering prices, etc.

Tying Concrete Reinforcing Bars with Bates bar ties and tying tool

Bates Bar ties were used on the largest reinforced concrete jobs in the United States and Canada.

A large stock of bar ties all sizes carried in stock for immediate shipment.

BATES SYSTEM FOR FILLING & CLOSING BAGS

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[illegible] Architectural Iron Works
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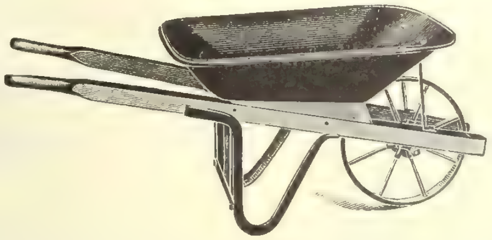
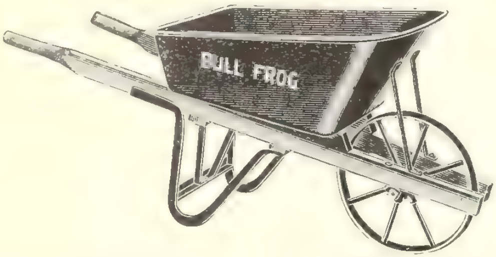
(Continued on page 8)

BULLFROG WHEELBARROWS are used everywhere by Contractors, Municipalities and Corporations who appreciate QUALITY.



No. 22-A-4 Contractors Concrete Barrow—4 Cu. Ft.—pressed steel tray, "Neverbreak" Wheels, and Angle Iron Braces—forward dump.

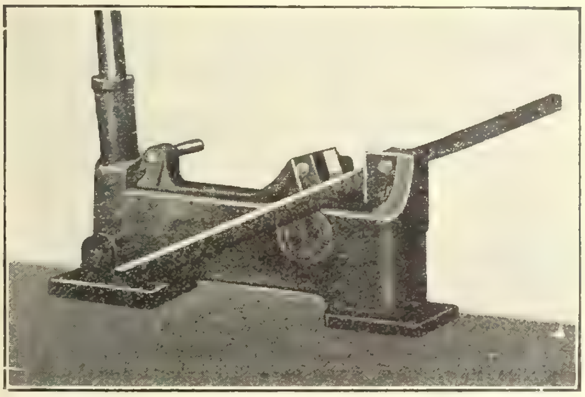


No. 66 Mortar Barrow—4 Cu. Ft. Extension Handles—forward dump, elevated tray—"Neverbreak" Wheels.

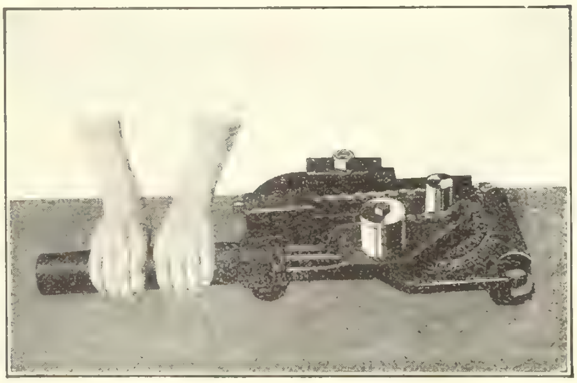
Nothing Made to Compete With Cheap Goods.

"Ewelco" Bar Cutters & "Efficiency" Bar Benders

are portable and will save you money

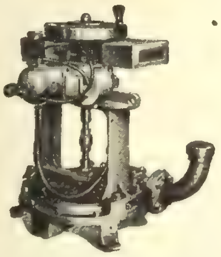


Weigh only 98 lbs. and will cut Bars up to 1" square—⅝" x 2" flats.



Net weight 70 lbs.—bends to any angle square bars up to 1¼"

Do Your Shearing and Bending on the Job.



Prompt shipment from our warehouses will take care of your urgent pumping jobs.

This pump weighs only 115 lbs. and is small enough—19½" x 19½"—to go down manholes, sewers, ditches, etc. Can be placed right in the water or used with a 20 ft. suction pipe. 2 H.P. EVINRUDE MOTOR—simple, sturdy, well built and dependable. Used everywhere—made in two sizes. Note large capacities.

	Height Raised	Gals. Per Hr.
No. 1 Pump with 2 H.P. Motor	5 feet	6500
	10 feet	5200
	15 feet	5700
	25 feet	4200
	35 feet	2000
1½ Pump with 3½ H.P. Motor	5 feet	8800
	15 feet	7950
	25 feet	6700
	35 feet	4850
	45 feet	1500

Watson Jack & Company, Limited

720 POWER BLDG. MONTREAL

B.C. Representative, E. G. Blackwell, 615 Hastings St. W., Vancouver, B.C.

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  Kerr Engine Company
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  Hepburn, Ltd., John T.

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  Muldoon, Ltd., J.
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  York Manufacturing Co.

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(Continued on page 10)

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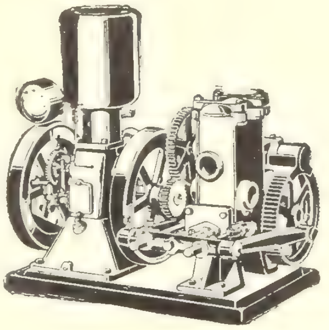

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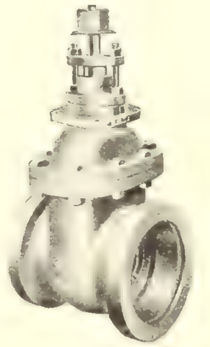

Fig. 400 F.M.

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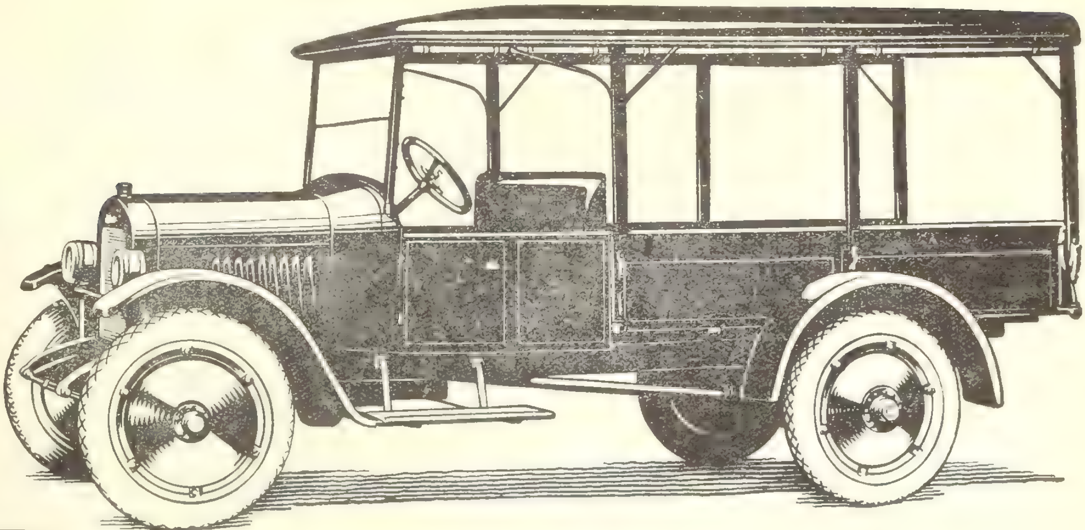

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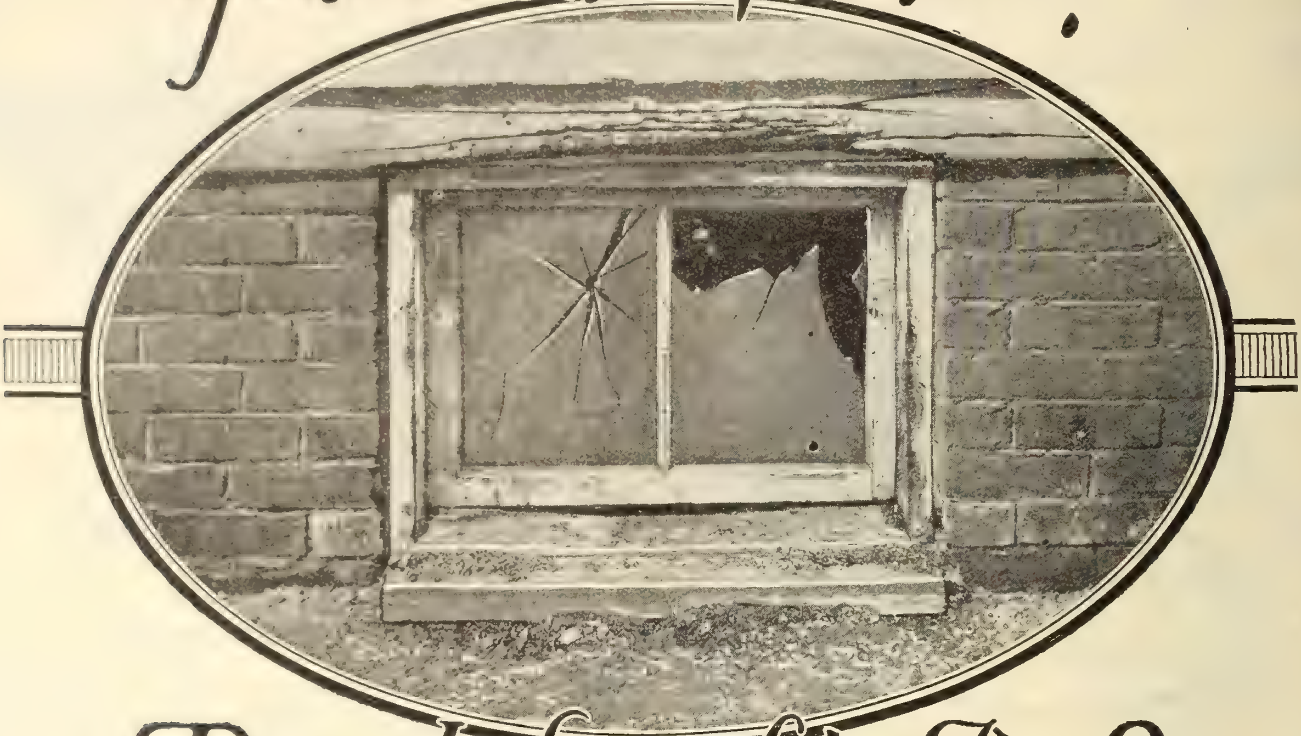

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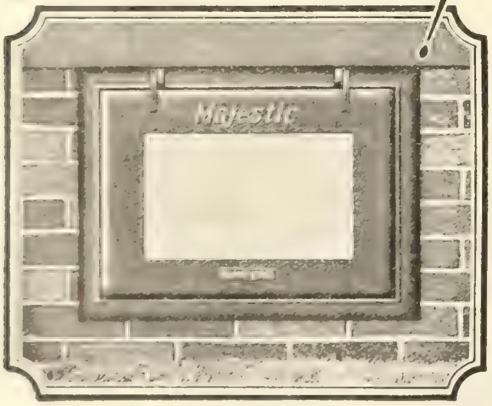

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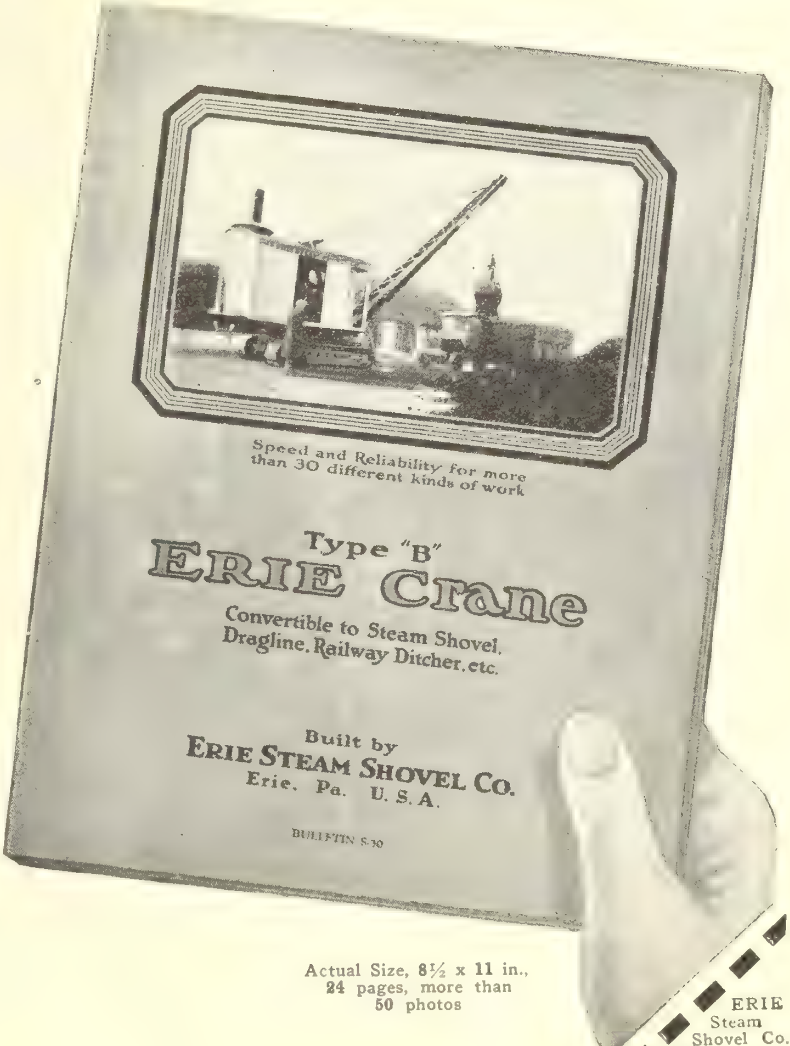

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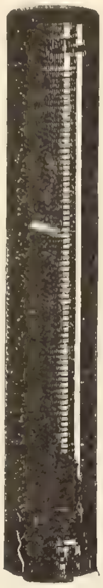

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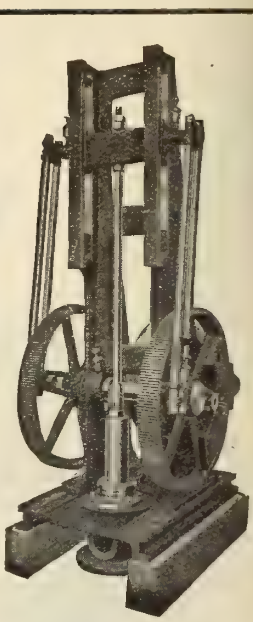

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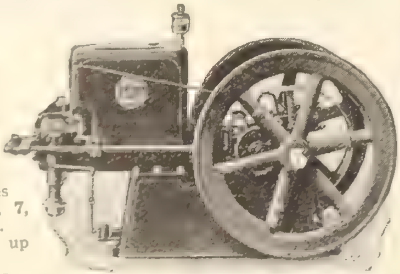

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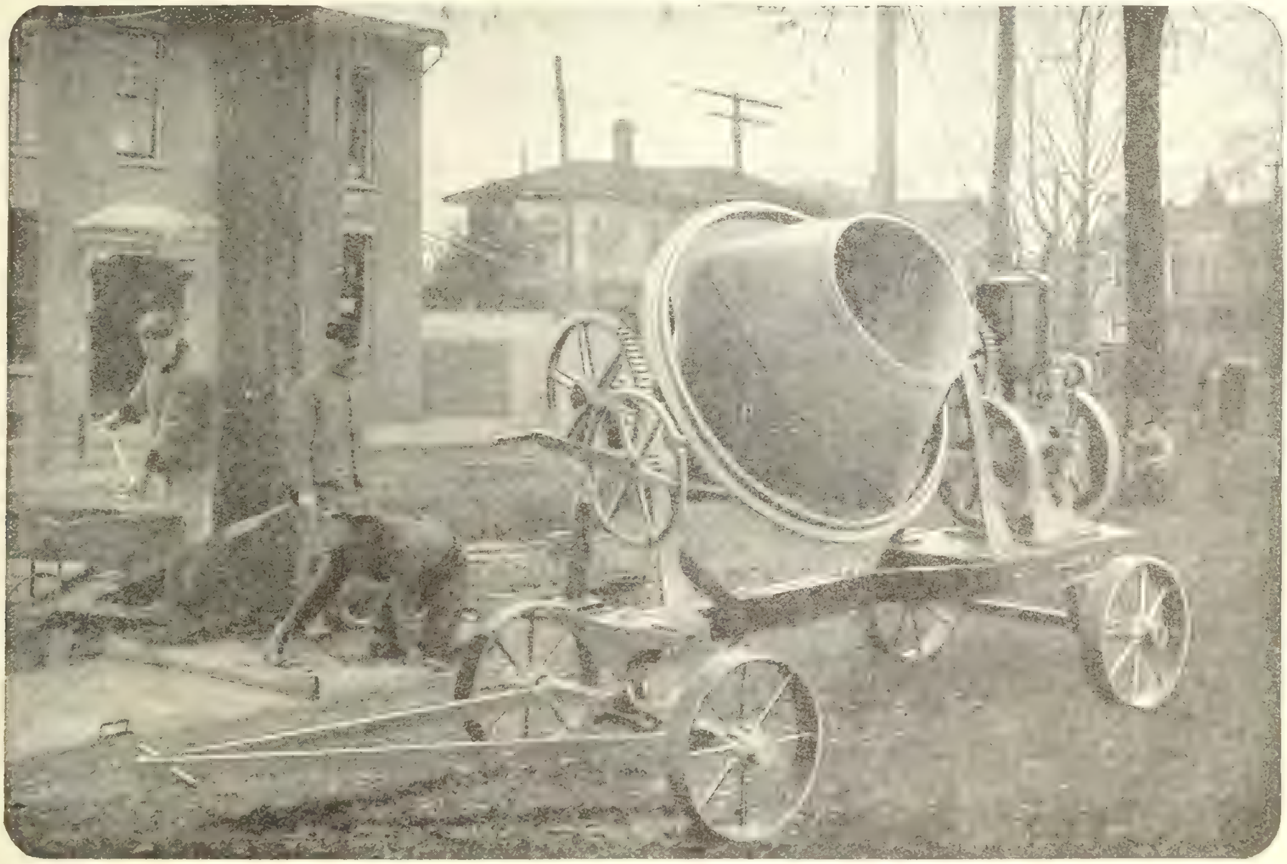

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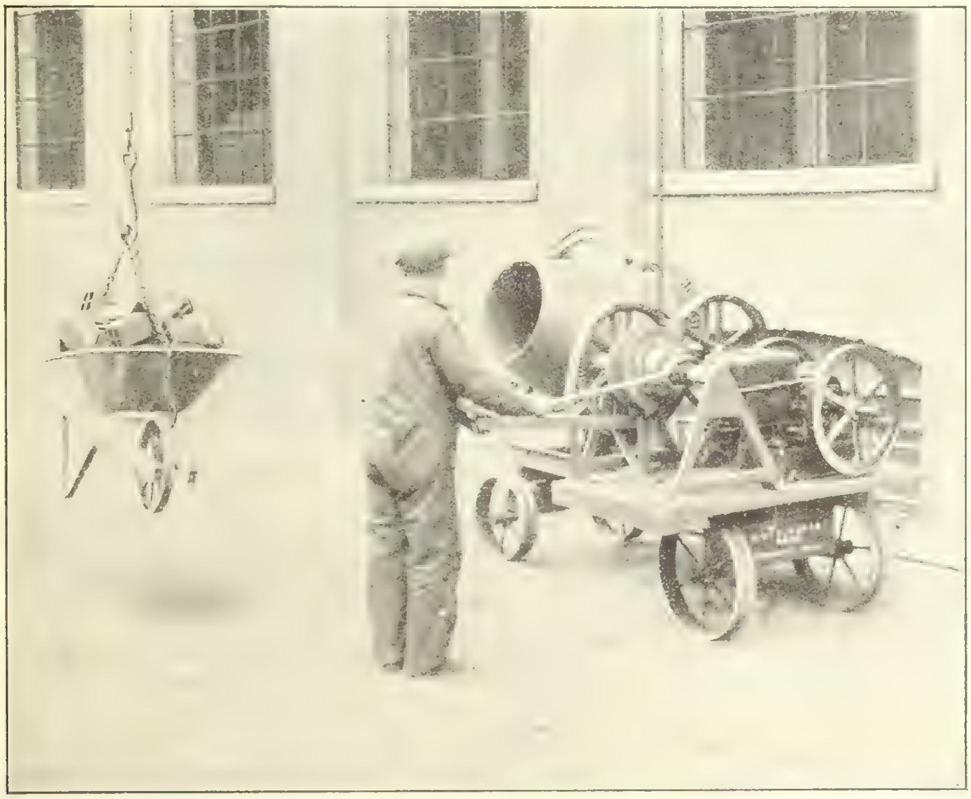

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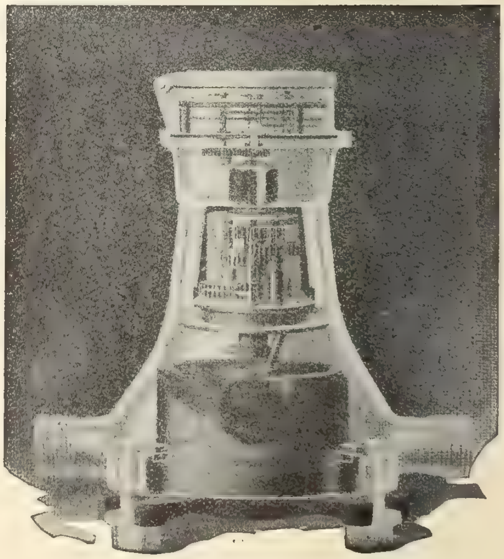

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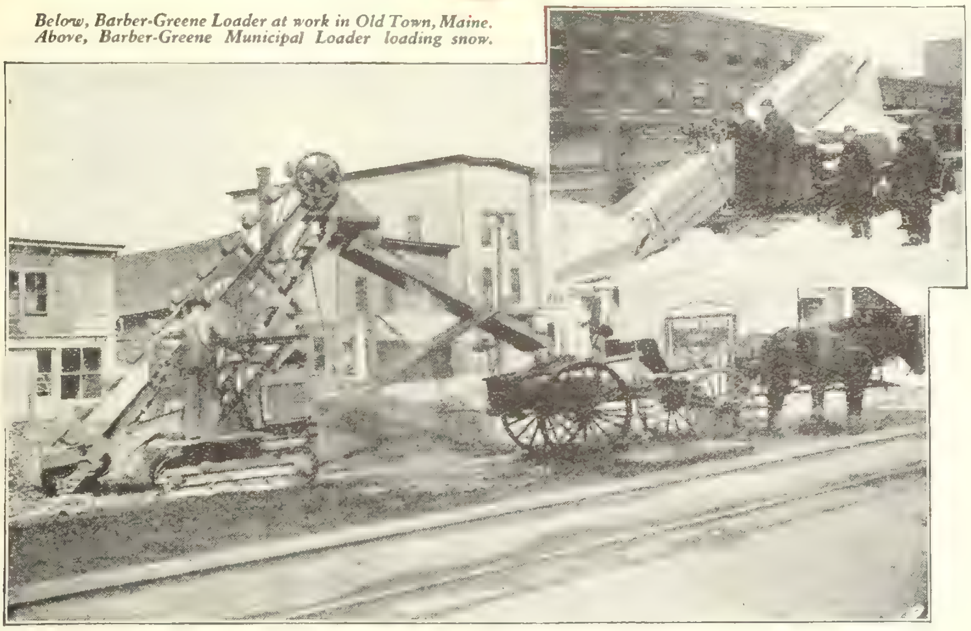

Below, Barber-Greene Loader at work in Old Town, Maine. Above, Barber-Greene Municipal Loader loading snow.

How Old Town Handles Crushed Rock

In summer the Municipal Loader replaces a gang with one man—in winter it replaces 60 snow shovelers

IN the fall of 1921, the city of Old Town, Maine, stored a great deal of crushed stone. By spring so much sand, dust and leaves were mixed with it that it wasn't fit for use. But they had a Barber-Greene Loader. They put a ½ inch screen, 10 feet long, under its spout. Then they turned a ¾ inch stream of water across the chute.

The crushed rock was washed clean by the time it got into the trucks.

More important to most cities is the fact that the Barber-Greene Loader replaces a gang of shovelers with one man—so that the stone supply, instead of being a drag on the work, becomes a pace-maker.

In Bartlesville, Okla., a Barber-Greene was used to load stone into horse carts on city paving work and did away with all stone shoveling at the storage piles.

In Oak Park, Illinois, Barber-Greenes in 1922 were so effective in loading sand and stone that not a single shoveler was used, not even for cleaning up.

Even in Tokyo, Japan, where labor is cheap, the municipality uses a Barber-Greene to save money and speed the work. The new Barber-Greene Municipal Loader has the additional advantage of having a removable boom so it can be converted into a snow loader in winter. Chicago says that in handling snow the Barber-Greene replaces 60 shovelers; Albany says that it is over 30 times as fast as hand labor; Boston "L" officials say that for them it is equivalent to 150 men. Because of the threatened scarcity and high cost of shovel labor the Municipal Loader will be especially popular this year. Send now for details, prices, and performance records.

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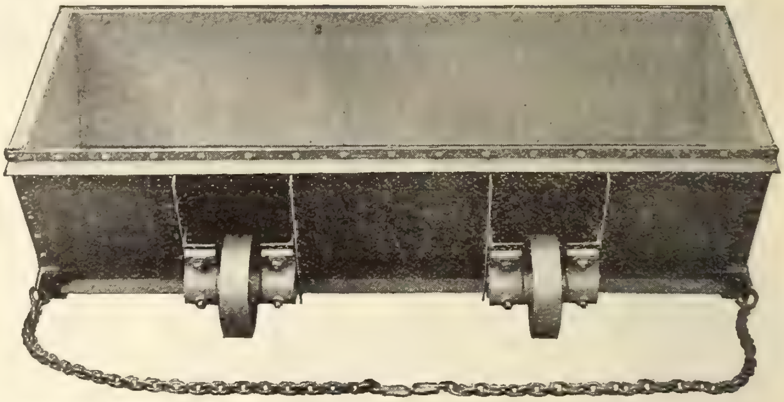

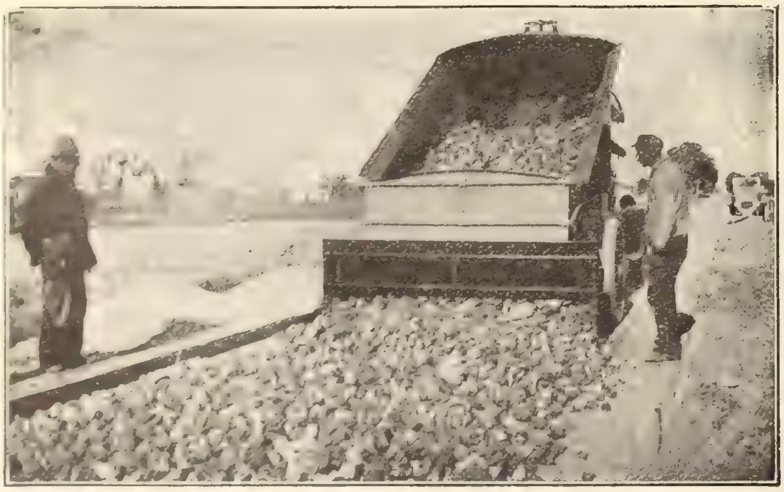

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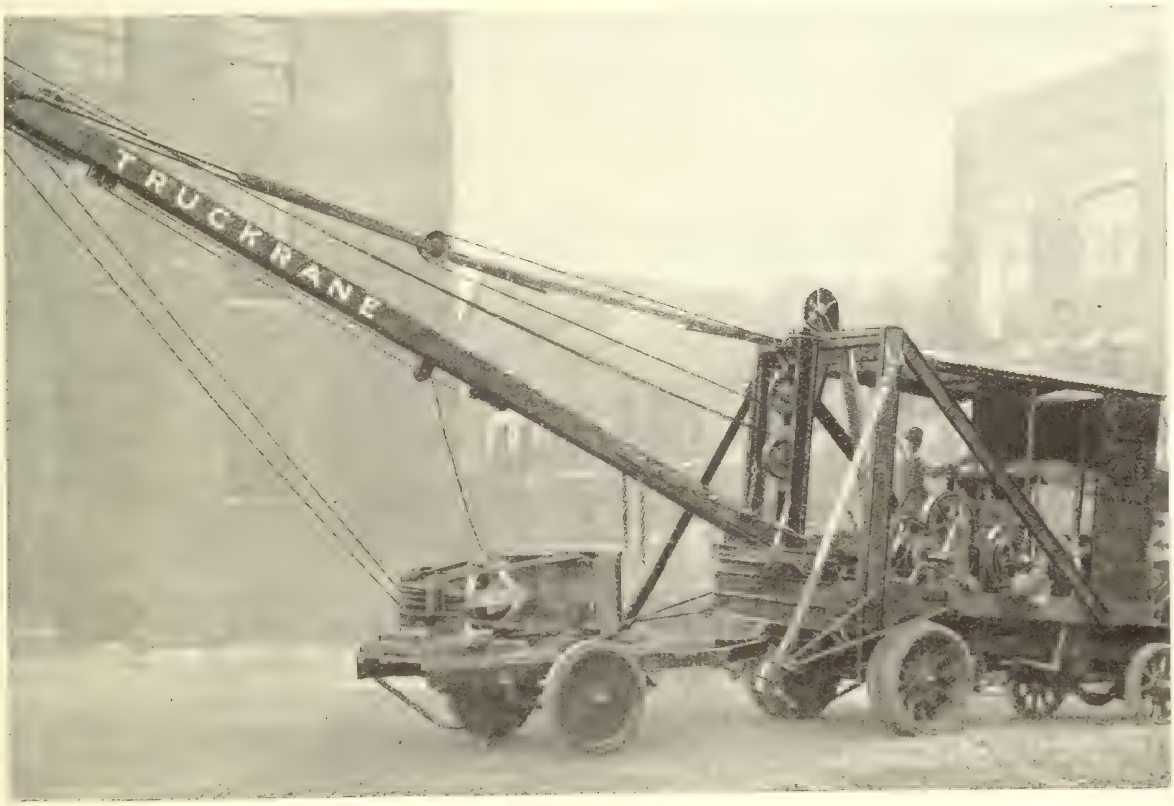

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Proof of the Superiority of Waterous Road Rollers

Contractors Demand The Best

Owing to the close competition in road building, contractors must of necessity have the most reliable and efficient machinery procurable—especially the roller which must be on the job every day and all day with no shut downs waiting for repair parts.

For this reason practically every road contractor in Canada is equipped with Waterous double cylinder steam road rollers, most of which have been purchased on repeat orders.

The fact that these contractors when they are in need of additional rollers continue to purchase Waterous is the highest praise that can be given to any machine.

Other points in favor of Waterous steam rollers are the extremely low cost of upkeep and the high resale value commanded by them.

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Regulation of Home Building

"Unfortunately there is no penalty for the contractor who builds a block of houses all alike."

A local newspaper writer thus expresses a sentiment that meets the views of ninety-nine citizens out of every hundred—indeed we believe ninety-nine contractors out of every hundred. The writer might well have added "and all of them unsightly."

There are only two reasons why this condition could exist, why this hundredth contractor continues to build eyesores. Either he is ignorant of the elements of art and architecture, or he is wilfully disdainful of the sensibilities of his fellow men. In either case there is call for action.

The time has about arrived when property owners and citizens generally should have some protection from house-builders of this type. It would work little hardship on them to have their plans approved by a suitable official or committee. Surely we have reached an age when the sole requisite in a home that it should not fall down is not enough.

Aside from offending the sensibilities of the vast majority of people who nowadays recognize the value of proper design, proportion and decoration in a home, there is the actual depreciation in dollars and cents that these unsightly buildings cause. It is no infrequent practice for some irresponsible builder to plant a cheaply constructed, fearfully-designed house in the midst of a group of attractive homes, or to throw together a monotonous row of cheap piles of brick and mortar in the closest possible vicinity to a well and carefully built district, making capital out of the fact that the restrictions allow this course.

It is quite time that some penalty should be imposed for these offences. Better still would it be to so regulate the building of homes as to make these offences impossible.

Time for Action on the Coal Situation

Time is passing quickly and we do not appear to be any nearer to a solution of the coal situation. Little coal is coming in from the anthracite fields, we have no guarantee that it will come, there is no sign of price recession and there is general expectation of a strike on August 1. Yet we sit idly by as if next winter were twenty years in the future. True, Sir Henry Thornton has been asked for a freight rate from Alberta and is being soundly abused because it doesn't just suit. A few months ago everybody was insistent that he operate our National Railway System as a business enterprise. Now, when he gives us a demonstration of his effort to do this we criticize him.

The point is, however—where is next winter's coal coming from? With a freight charge of $9.00 a ton, a cost at the mill of $4.00 and a delivery charge of $2. Alberta coal can be laid down in Ontario at about $15.00 a ton. Why not go ahead and bring it in? The answer immediately is that the anthracite dealers would cut the price and promise immediate delivery. Are the citizens then, going to be allowed to suffer or will the government do something?

We suggested some weeks ago, and nothing better has been offered in the meantime, that an arrangement be made between governments as to the amount of anthracite coal that can be guaranteed delivery. Suppose Canada now imports 5,000,000 tons and suppose the U. S. Government or the U. S. mine owners will only guarantee 3,000,000. Then cannot our own government say "all right, then we will only accept that amount and will take immediate steps to provide the other 2,000,000 from our own fields." What risk would there be then in bringing in that amount from Alberta? What matter, in fact, what the price may be so long as it is within reason? For our fear, after all, is not the cost of the coal but the danger that we may not be able to get it at any price. If nothing else is available there need be no fear that householders will not buy the coal.

The need for "action" is very urgent. Thousands of householders are today waiting, with the money in their hands, to stock their next winter's supply of coal. Will they still be waiting when the snow begins to swirl next December? It seems to be a case for government action. When will the government move?

Highway Officials to Confer at Good Roads Convention

The importance of the tenth annual convention of the Canadian Good Roads Association at Hamilton June 11, 12, 13 and 14 next has been considerably increased by the official announcement that representatives of all the highway boards of the various provincial governments will hold their annual conference during the convention in Hamilton. Every province sends one or more of its highway department chiefs to the gathering, and these men will meet together and discuss details of administration, policies, contract clauses, cost data, construction methods and other matters which contribute to securing efficiency in conjunction with economy in highway improvement, and which will be invaluable in planning future construction work.

The tentative official program has been sent out by George A. McNamee, the secretary of the Association, and bears out the early promise that many of the most eminent experts in highway construction on the American continent will participate in the convention, either reading papers or leading the discussions on them. The official welcome of the delegates, who are coming from all over the Dominion, will take place on the Monday morning, when the president, the Hon. J. L. Perron, will occupy the chair. Brief speeches by visiting premiers and ministers of highways of the various provinces will occupy the remainder of the morning, a large and representative gathering being anticipated. S. L. Squire, the chairman of the executive, will reply to the welcome and after lunch the delegates will get their first glimpse of some of the permanent types of pavement that are comprised in the Ontario highway system. The trip will be about sixty miles and will embrace Guelph, Galt and Kitchener, returning via the Clapperton cut and fill. The morning session of Tuesday will be devoted to discussion on provincial systems of highways, and permanent construction, with some valuable data regarding the test road experiments that have been carried out in the United States..

Who Should Pay for The Road

The Hon. F. C. Biggs, Minister of Roads for the Province of Ontario, will preside at the afternoon session, which will be one of the most important of the convention. The subject under discussion will be, "Who Should Pay for the Road?" and inasmuch as the initial address will be given by A. W. Campbell, First Commissioner of Highways for the Dominion Government, the debate on it is likely to be long and interesting, as all the provinces are strongly in favor of federal aid being given to highway construction and the Dominion Government has announced that it will not make any further grants to the provinces after next year. The debate will be opened by H. S. Carpenter, deputy minister of highways for the province of Saskatchewan, and will be participated in by representatives from all the provinces without doubt. Maintenance matters, dealing with the various methods and cost data thereon, as well as providing valuable information as to scrapers and graders for earth and gravel roads will be the subject of a paper by E. A. James consulting engineer of Toronto, the discussion being opened by B. M. Hill, chief provincial highway engineer of New Brunswick. The chairman of the Manitoba Good Roads Board will initiate a discussion on the best means of conducting a patrol system for effective highway maintenance.

At the Wednesday morning session A. P. Sandles, of Columbus, Ohio, one of the best informed highway engineers of the continent, and always a popular favorite at road conventions because of the practical talks he gives, will speak on methods for reconstructing old macadam roads—a subject of vital interest to many municipal authorities. The paper on the subject will be read by James Pearson, of Toronto. Another interesting topic will be introduced by J. S. Crandell, consulting engineer of New York city, who will give a paper on the use of refined tar in construction and maintenance, the discussion on it being opened by A. F. Macallum, Commissioner of Works, Ottawa. At the afternoon session cement concrete and the construction of single track permanent pavements will be dealt with in a paper by A. M. Jackson, city engineer of Brantford, Ont., the discussion being opened by J. G. Wilson, road superintendent of Halton Co., Burlington, Ont. Bituminous surfaces will be dealt with by Col. Keith Compton, chairman of the Paving Commission of Baltimore, Maryland, while the discussion will be led by Prof. Scott, city engineer of Niagara Falls, Ont. Road machinery will be the subject of a paper by J. Lefebvre Boulanger, deputy minister of roads, Quebec, while there will be several other interesting papers, the speakers for which have not yet been definitely fixed.

Traffic Regulation

The annual general meeting of the association will be held on this afternoon, when the directors and officers will be elected and reports considered, the directors meeting afterwards to appoint the various committees. The annual dinner and entertainment in the evening will be at the Royal Connaught Hotel, the headquarters of the convention. On Thursday morning the proper use of the highways, dealt with from various angles, will be discussed, the paper being contributed by E. Thompson, director of the National Traffic Association, New York. The regulation of traffic, enforcing speed laws, the control of the autobus and motor truck, hand and danger signals, headlight regulations and the question of lights on all vehicles will be among the subjects discussed. Tourist Traffic will be dealt with in a paper by John Pierce, passenger traffic manager of the Canada Steamship Lines, Montreal, and also discussed by J. B. Harkin, commissioner of the Canadian National Parks, Ottawa. The concluding afternoon will be devoted to a hundred mile automobile drive to Niagara Falls, Queenston and Brock's Monument, cars being provided for all delegates. The Ladies' Committee, headed by Mrs. Judge Gauld is making complete arrangements for the comfort and entertainment of the ladies accompanying the delegates, while T. J. Mahoney is chairman of the reception and entertainment committee comprising representatives of the various public bodies and organizations in Hamilton and the district.

Unusual Methods for Constructing Sewage Disposal Plant for Muskoka Hospital

Several Difficulties Developed in Connection with its Location and Building—Constructed in a Submerged Steel Tank, Towed to the Site and Sunk on Rock Fill

The design and location of the sewage disposal plant for the new Muskoka Hospital being built for the National Sanatorium Association near Gravenhurst, and which is nearing completion, necessitated the use of rather unusual methods of construction. The sewage disposal plant forms part of the general scheme of buildings which are being erected to replace the hospital destroyed by fire about two years ago. In designing the water supply, fire protection, and sewage disposal for this scheme, provision has also been made for the rehabilitation of the existing Muskoka Cottage Hospital near the site of which the new buildings are located. With mention of the fact that the disposal plant is required to take care of the sewage from both institutions further discussion as to its functions may be omitted.

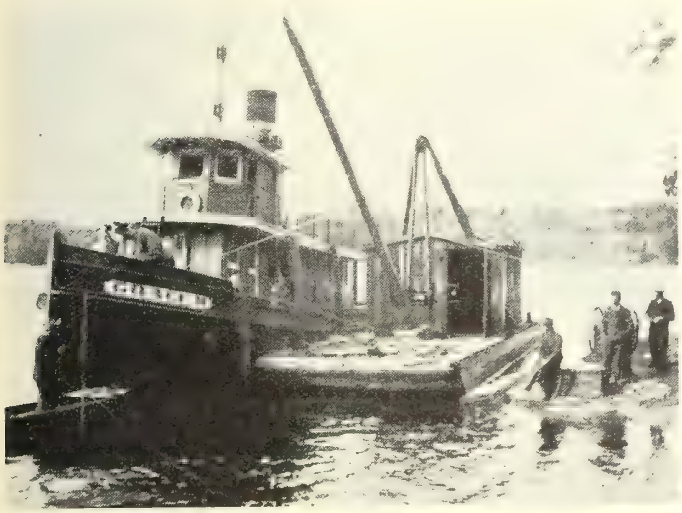


Fig. 1—Diver and tug clearing the lake bottom to receive disposal tank

The outside dimensions of the building designed to house the plant are 46′-6″ x 13′-6″.

Difficulties in the way of Location

The intake for the fresh water supply from the new pump house is located in Muskoka Bay which lies to the south of the institution. The selection of a site for the sewage disposal plant was therefore restricted to Murray Bay at the north. In order to provide sufficient fall and at the same time take care of the existing sewers from the Cottage Hospital it was found that the bottom of the aeration and settlement tanks would be approximately eight feet below high water level. The formation of the shore line on Murray Bay, and more particularly the seamy nature of the rock precluded the possibility of locating the plant on the shore where the excavation could be blasted out. Experience on the rock excavation for the other buildings had shown that blasting would open up seams for a considerable distance from the excavation and it would have been an expensive operation to keep the excavation dry while the foundations were being put in. The cost of a cofferdam to surround the site was also found to be prohibitive for the size of the plant.

It was therefore decided to build the building in the lake in a submerged steel tank resting on rock fill and a site was selected for this purpose. An examination of the lake bottom on this site showed that although the bottom was fairly level, the underlying rock sloped downward from the shore at an angle of about 30 degrees. In this location the rock on the shore side of the site was covered by about two feet of muck and on the lake side by about eight feet. It was felt that, no matter how much care

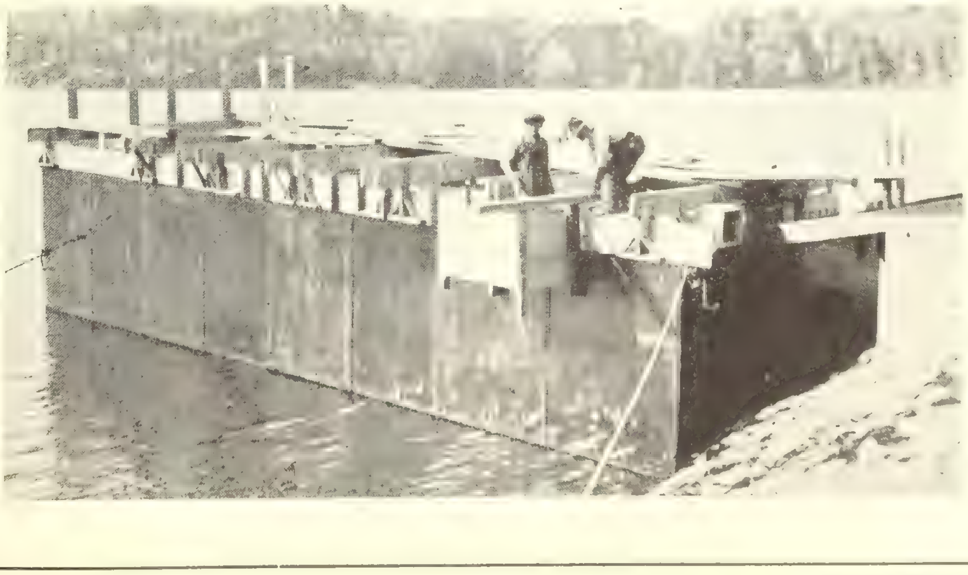


Fig. 2—Steel tank with forms in place ready for the pouring of concrete.

was exercised in filling, there would be no assurance that the weight of the building would not in time cause uneven settlement of the fill.

A site was then selected partly on the shore and partly in the water. At this point on the shore line a ledge of rock running out into the lake provided a face to work from and facilitated the blasting. Rows of holes were drilled parallel to the face by a steam drill operated from the boiler of a tug, and the rock was shot away approximately to the level of the bottom of the tank. In blasting the rock it was not possible to shoot it all clear of the site, and as there were no floating derricks of sufficient capacity available, other methods had to be devised to clear the bottom. A diver and heavy towing tug were employed for this work. The diver attached chains around the rocks which were pulled clear of the site by the tug. Fig 1 shows the diver and tug at work clearing the lake bottom. After the site had been cleared of the large rocks the diver levelled the bottom with small broken stone and gravel. A floating templet was used in order to insure a level bottom for the tank to rest on.

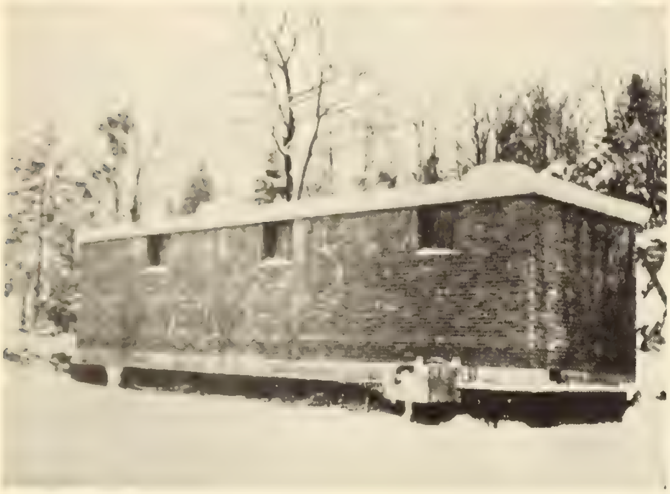


Fig. 3—The completed sewage disposal building

A watertight steel tank of the same outside dimensions as the building and 9′-6″ deep was shipped to the site in sections, built up on shore and launched. After the forms had been built the tank was towed to a point on the shore line where a steep flat rock brought the top of the tank to a convenient height for pouring from land. Fig 2 shows the tank with forms in place ready for pouring. About half the concrete of the aeration and settlement tank walls was poured in this position. The tank was then towed to its permanent location and the remainder of the concrete poured when it settled evenly on the prepared bottom.

The rock which had been blasted from the excavation was left close to the tank when it was pulled out by the tug but in order to prevent any movement about five hundred cubic yards of rock were brought to the site on scows and dumped around the outside of the tank and tightly against it. A one storey brick building with concrete roof was then built on the concreted steel tank. Fig. 3 shows the completed building.

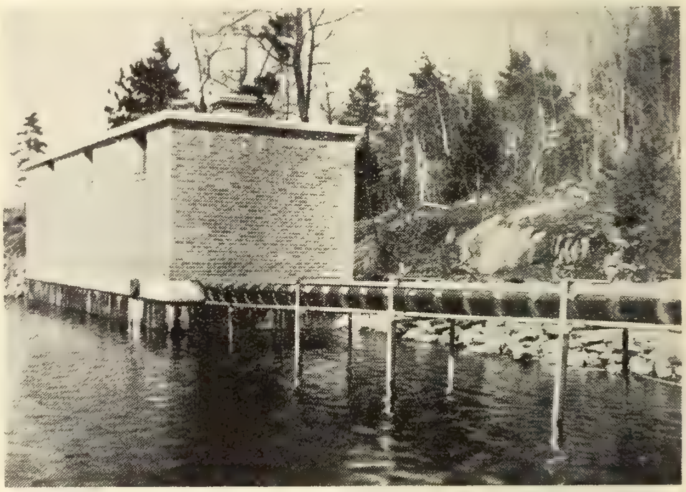


Fig. 4—Another view of the plant

Chas. S. Cobb of Toronto was the architect. The Jackson-Lewis Company Limited, Toronto, were the general contractors.

Rivet Passing by Pneumatic Devices

The Hand Passing of Red-Hot Rivets is Now Replaced on Some Jobs by a Method in which Compressed Air is Used to Convey the Rivets from the Forge to the Driver

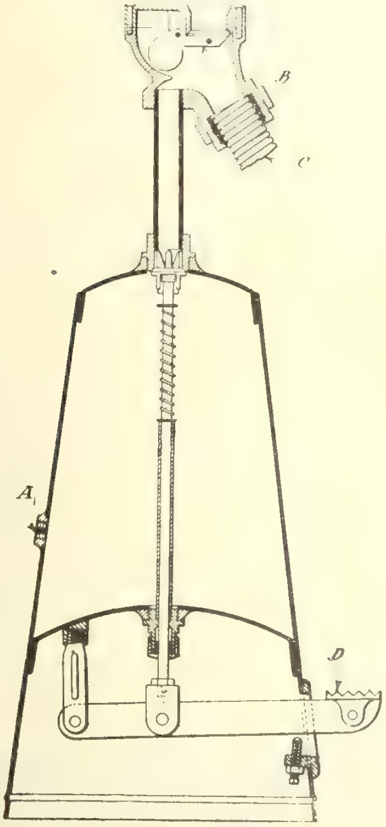
"Do it pneumatically" is more than a catch word for the promotion of business. Each day compressed air is revealed in a new field of usefulness, and, as a rule, it does the work assigned it better than any other power or operative medium. Probably one of the most effective and novel uses of compressed air is that of passing rivets from the forge directly to the riveting gang at work perhaps scores of feet away and out of sight of the rivet heater.

On this subject, Robert G. Skerrett writes in "Compressed Air Magazine" as follows:

The hand passing of red-hot rivets has long been a familiar spectacle wherever structural steelwork of any sort was under way. Time and again wondering spectators have watched a forgeman take with his tongs a rivet from its flaming bed and toss it confidently a considerable distance to a waiting lad, armed with a bucket or a handy can, who, after catching the rivet on the fly, would pass it thence to the riveting gang. How many of the marveling onlookers traced what followed when the passer failed to catch the glowing bit of steel? How many realized the number of injuries inflicted upon luckless persons when those searing missiles hit them instead of landing in the "catching can?"

Shortcomings of Hand Passing

The records of every modern shipyard, the story of the erection of every skyscraper, and the casualty list of the building of every big bridge will be found fairly well filled with instances of bodily hurt or harm done by rivets that went astray in the passing. Not only that, but a misdirected rivet is seldom picked up soon enough to be used at the time, if used at all; and the hand passing of rivets undoubtedly cuts down efficiency and working speed. Realizing these various shortcomings, William B. Furman devised a pneumatic rivet-passing device and first put it in service at the yard of the Sun Shipbuilding Company in April of 1920.



Pneumatic rivet passer

A—Air inlet to compressed air tank.
B—Balanced check valve which allows rivet to drop into pneumatic passer.
C—Connection for flexible metallic hose by which the rivet is blown to the rivet gang.
D—Treadle which releases a blast of compressed air for the propulsion of the hot rivet through the hose.

The Furman rivet passer was the outcome of a realization of what might be gained if heated rivets could be delivered to isolated compartments so quickly that they would still be hot enough to be driven properly and to draw snugly together adjacent metal surfaces. Another aim was to cut down the expense of passer boys commonly necessary in relaying the rivets to their destinations; and a further desire was to make it practicable to do all the rivet heating on deck or in the open air and thus to avoid locating rivet forges in more or less closed compartments where the gas might affect the workers.

In developing his equipment, Mr. Furman employed rubber hose at the start for conduits through which to blow his rivets from the forge to the riveting gangs. But this type of conveyer proved unsatisfactory, because it wore out rapidly and would burn through whenever a hot rivet became lodged in a bent section of the hose. This situation was corrected when metallic flexible hose was substituted. The manufacturers of this commodity, so it seems, promptly produced a special hose for rivet passing, and sizes are now available for the handling of rivets ranging from ¾ inch to an inch. For example, hose having an inside diameter of 1⅜ inches is furnished for the passing of ¾-inch rivets; hose having an internal diameter of 1 11/16 inches is made to take care of ⅞-inch rivets; and 2-inch hose is to be had for 1-inch rivets.

The pneumatic rivet passers now in service at the Chester yard of the Sun Shipbuilding Company are operated with air at a pressure of from 80 to 85 pounds per square inch; and experience has shown that these machines are capable of sending rivets through three lengths of hose, that is 150 feet, quite satisfactorily. The hose may run around corners and have several bends in it between the pneumatic passer and the discharge end, and yet the rivets will be sped onward to their destination without a hitch. All the heater has to do is to drop a rivet upon a balanced check valve, which allows the rivet to fall into the admission end of the hose; then, by pressing upon a pedal, a blast of compressed air is released from the passer reservoir; and the impulse of this released air serves to blow the rivet quickly to the farther end of the hose. Incidentally, the expansion of the air tends to cool the hose and to prevent it from becoming troublesomely hot.

The foregoing description covers broadly both the

Pneumatic rivet passers in service aboard a vessel undergoing repair.

pneumatic rivet passers now in use at the Sun Shipbuilding Company's plant as well as a modified apparatus known as the "Penflex Rivet Gun," which is being manufactured and marketed by the Pennsylvania Flexible Metallic Tubing Company. A longitudinal section of the latter machine is shown herewith. For the sake of those who may be interested in details, the Penflex apparatus consists of a galvanized metal tank about ⅛ inch thick; and a ¾-inch pipe-thread inlet connection is welded to the side of this reservoir so that the air supply line can be coupled to it.

The gun is equipped with an operating lever placed at the bottom of the air tank; and this lever controls the discharge valve which is normally seated by a spring against a hard-rubber seat carried in the top of the tank. The valve is opened by the movement of a steel rod attached to the treadle. At the discharge end of the conveyer tube there is attached a metal rivet receiver. This receptacle is provided with a buffer block, supported by a buffer spring, which prevents the plastic rivet from being deformed when suddenly arrested upon reaching the end of its run. The weight of the Penflex gun is about 68 pounds; and its overall height is substantially 36 inches.

Fifteen Weeks' Experience

What these rivet guns can do is well exemplified in the following account of fifteen weeks of service in an important shipyard. Let us quote: "On new construction work the gun was used for passing rivets to riveters. Approximately 20,000 rivets were passed by the rivet gun to the torpedo-defense bulkheads and the boiler-room bulkheads, and about 8,000 rivets were passed to the double-bottom compartments and to the tank tops and shell. On alteration and repair work, the gun was placed on the main deck and was used for passing rivets two decks below and to very inaccessible locations. When used for this work, it was possible to eliminate all passer boys—four boys ordinarily would have been required on this job. By using the rivet gun, the rivet gang consisted of only the heater boy, the riveter, and the holder-on: the rivets being passed directly to the holder-on who did not find it difficult to carry the receiver from hole to hole or to attract the attention of the heater boy by calling through the flexible tube for rivets as they were required.

"A test was also conducted for passing rivets overhead, and it was found that rivets could be passed satisfactorily to a height of 91 feet, the average time required for delivering rivets to this height being two seconds. The rivets were delivered with sufficient velocity to indicate that they could be successfully passed still higher, that is, to a height of 125 feet."

During the laboratory trials to determine the air consumption of the rivet gun working under various conditions considerable data was obtained; and the accompanying table has been compiled therefrom. The figures, which cover a single rivet, are based on the mean air consumption for passing 100 rivets, and are corrected to cubic feet of free air per rivet at an absolute pressure of 14.7 pounds per square inch. It is believed that the air consumption in actual service will be found slightly higher because the laboratory trials were conducted under very favorable conditions. Even so, experience on the job has disclosed that rivets can be delivered very rapidly and with no perceptible loss of heat while in transit. Further, the rivet arrives at the receiver without scale owing to the fact that the scale is removed by the rivet striking the sides of the metal tubing during its journey.

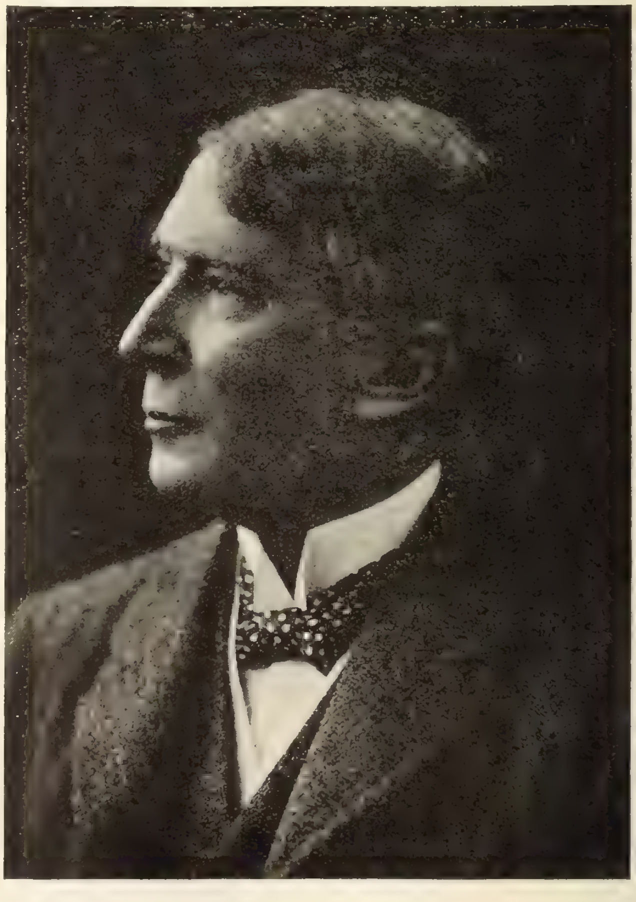
Advantages

It is authoritatively stated by a hull superintendent that the following advantages can be justly claimed for the pneumatic rivet passer: A saving in money; the elimination of passer boys; fires can be kept out of closed spaces, thus benefiting the riveting gangs as well as other trades working there; there are no ashes or waste coke lying around that may clog holes where the riveting is being done; and a rivet can be delivered and placed in a hole ready to drive in a much shorter time than that required when passer boys are employed, insuring a hotter rivet that is easier to drive and the doing of a better job, withal.

Air Consumption Per Rivet

Size and type of rivet.	Travel 38 ft. Vertical, head first. cu. ft.	Travel 38 ft. Vertical, point first. cu. ft.	Travel 54 ft. Horizontal, straight line. cu. ft.	Travel 54 ft. Horizontal, Circular. cu. ft.
⅞ x 2 in. countersunk	4.7	3.59	3.06	2.28
⅞ x 2 in. pan head	4.45	Would not pass	3.15	2.72
¾ x ¾ countersunk	2.85	3.12	2.0	1.7
¾ x ¾ in. pan head	2.87	3.06	2.02	1.7

Mr. Frank Darling Passes Away



On Saturday, May 19, Mr. Frank Darling, the eminent Canadian Architect, of the firm of Darling and Pearson, Toronto, passed away. He had a very notable career and was responsible for some of Canada's finest buildings.

How Should a Contractor's Financial Statement be Arranged?

The Forms that Are Considered Necessary by the Associated General Contractors of America

Skill, Integrity and Responsibility

Financial Statement

Copyrighted 1922, The Associated General Contractors of America, Inc.

Skill, Integrity and Responsibility

The following tabulation of assets and liabilities, with any exhibits hereto attached, constitutes the financial statement of ____________________

Address ________________ as of __________ 19__
Date

Assets

Current Assets

Cash on Hand and in Bank $
Accounts Receivable, Retained Percentages—within 90 days
Notes Receivable—within 90 days
Negotiable Securities
Inventory Value of Materials in Stock
Deposits—Bid, Contract, and other Guarantees, Recoverable within 90 days
Total Current Assets

Deferred Assets

Accounts Receivable, Retained Percentages—over 90 days
Notes Receivable—over 90 days
Interest Accrued
Insurance Fund
Deposits—Bid, Contract and other Guarantees, Recoverable over 90 days
Credit Balance from Under-Run of Progress Estimates on Current Contracts
Total Deferred Assets

Fixed Assets

Real Estate
Construction Equipment
Furniture and Fixtures
Total Fixed Assets

Miscellaneous Assets

Total Miscellaneous Assets

Total Assets $

Liabilities

Current Liabilities

Accounts Payable $
Notes Payable
Total Current Liabilities

Deferred Liabilities

Equipment Obligations
Real Estate Incumbrances
Reserves
Interest
Insurance
Tax
Equipment Depreciation
Debit Balance from Over-Run of Progress Estimates on Current Contracts
Total Deferred Liabilities

Nominal Liabilities

Capital Stock Issued
Surplus, 1st of Fiscal Yr. $______
Profit or Loss, Current Yr. $______
$______
Less Dividends Declared $______
Present Surplus
Total Nominal Liability

Miscellaneous Liabilities

Total Miscellaneous Liabilities

Total Liabilities $

Of the Above Accounts Receivable ________________ have been assigned
(None or the amount)

Explanatory: ____________________

____
(Firm name)

Date Signed __________ 19__ **By** ________________

Financial Statement—Exhibit Sheet 1

Copyrighted 1922 A.G.C. of A.

Accounts Receivable—From Construction Contracts and Sales

Contract or Sale	Total Amount	Amount Paid	Amounts Receivable—See Footnote			Amount of Contract Uncompleted
			Total Invoices or Estimates Due	Retained Percentage	Total Amount Receivable	
Total Receivable within 90 days						
Total Receivable over 90 days						

Note.—The amount to be entered under the heading "Total Invoices or Estimates Due" for any contract is the net total, that is the full estimated value of work performed less the amount retainable therefor.

Notes Receivable

Receivable from	Date of Maturity	Amount
Total Receivable within 90 days		
Total Receivable over 90 days		

Notes and Equipment Obligations Payable

Payable to	Date of Maturity	Amount
Total Notes Payable		
Total Equip. Obligations Payable		

If additional blank lines are necessary, attach another sheet.

Financial Statement—Exhibit Sheet 2

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Negotiable Securities—Listed and Unlisted

Issuing Company	Description of Securities	Date of Maturity	Par Value	Purchase Price	Current Market Price
Total Listed					
Total Unlisted					

Credit or Debit Balances from Under-Run or Over-Run of Progress Estimates on Current Contracts

Contract	Estimated Total Amount	Per Cent Complete	Total Expenditures to Date	Total Estimates Due Including Retained Per Cent	Credit Balance for Under-Run of Estimates	Debit Balance for Over-Run of Estimates
Totals						

Note.—Any credit balances in the above table show the value of work performed on current contracts but not yet included in estimates, and are entered as deferred assets. Any debit balances show an overpayment for work performed and are entered as deferred liabilities.

Financial Statement—Exhibit Sheet 3

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Real Estate and Real Estate Incumbrances

Description and Location	Improvements	Value		Amount of Incumbrances	Equity
		Assessed	Cash		
	Totals				

Construction Equipment and Reserve for Equipment Depreciation

Description of Equipment	Date of Purchase	Purchase Price	Present Value	Depreciation Reserve
Totals				

In addition to the above forms, an experience statement, listing construction projects completed, is considered desirable

Standby Units for Pumping With Comparison of Operating Costs

What is the Best Type of Plant for Standby Purposes?—The Requirements of Small and Large Works—Fuel or Power Consumption and Operating Expense

By **E. M. PROCTOR**

Before the Canadian Section of the American Water Works Association, May 19

Before the days of hydro-electric energy the waterworks pumping station was operated by steam power. With the spread of hydro-electric energy throughout Ontario, which was much cheaper for power purposes than steam, nearly all waterworks systems have converted their plants from steam operation to electrical. With the installation of electric equipment these steam plants were faced with the necessity of either keeping fire banked in their boilers and their steam pumps in readiness for operation, or the installation of some other standby unit. It has been found that the cost of banking coal fires amounts to such a large item that most plants have abandoned steam equipment entirely and have installed pumping units, which do not require a continual operating expenditure. It will be the purpose of this paper to outline briefly the various standby units on the market today and give some idea of the cost of such units together with their operation.

For the small waterworks plant pumping below 4,000,000 gallons of water a day the gasoline engine driven centrifugal pump has become standard equipment. These gasoline engines are built to operate at speeds ranging between 1,000 and 1,400 r.p.m. and are directly connected to the centrifugal pumps. They are comparatively cheap and when equipped with storage battery electrical starting equipment can be started amost immediately and have proved very satisfactory. The operation of these units must not be considered in any other light than as emergency units. Their fuel consumption is about one pint of gasoline per h.p. per hour and when in best running condition for compression and properly adjusted for timing and carburetor supply, the consumption may be brought down to nearly ½ pint per h.p. per hour. If we assume that the average consumption is .7 pints per h.p. per hour and the cost of gasoline is $0.31 per imperial gallon, the cost of operating the gasoline engine is 2.71 cents per h.p. per hour. A pump supplying 1,000 gallons per minute at 100 lb. pressure will cost $2.71 per hour or 4.5 cents. per 1000 gals. of water for gasoline alone. This is admitted to be a very high cost of pumping, but when one takes into consideration the capital costs of the various units as well as the comparatively short time which this pump will be called upon for operation, the operating costs of the gasoline engine driven pump are, without doubt, the least.

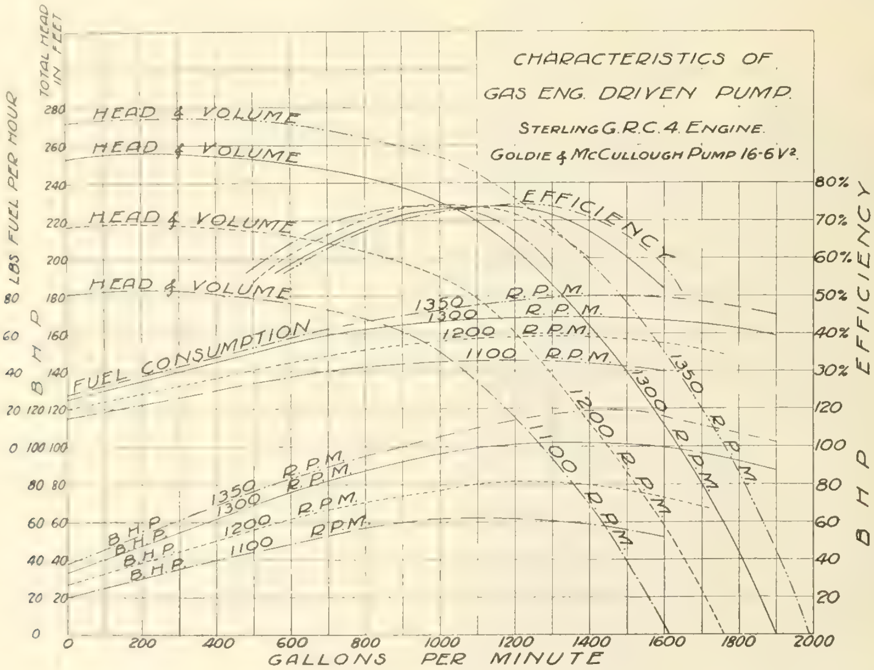


Fig. 1—Characteristic curves

Must Study Speed Required

One feature in connection with the design of standby units which is deserving of careful study is the behaviour of the centrifugal pumps under varying speeds and the designer should go carefully into the question of the speed of the pump which will be required for his work. The speed of the engine can be varied by changing the amount of gasoline fed to the carburetor. The engines are designed for operation between 1000 r.p.m. and 1,400 and if one will stand beside one of these engines and note the difference in vibration and laboring of the engines for speeds between 1200 and 1,400, there is no question that he will readily come to the conclusion that the speed of 1,200 for a gasoline engine is plenty high enough. Having this in mind the pump should be designed for an operating speed of 1,200 r.p.m. which to give a certain capacity will call for a much larger pump than at 1,400 r.p.m. In tendering on this class of equipment the manufacturers too often figure on the smallest sized pump and the highest speed of the engine and the operator consequently gets a unit which will only do the specified work when operating at its utmost speed.

On figure "1" is shown the various characteristic curves for a given pump at various speeds. It can be seen on this chart that a 100 g.p.m. pump at 100 lb. pressure at 1,300 r.p.m. has its pressure reduced to 65 lbs. if operated at 1100 r.p.m. These curves show that the efficiency of the pump below the design discharge increases for a drop in speed and above the design discharge decreases for a drop in speed. The gasoline consumption per h.p. per hour ranges the same for varying heads for constant pressure. The consumption per h.p. per hour decreases with the increase of speed.

There is a wide field for investigation of the proper type of pump to be operated at varying speeds, as the standard centrifugal pump is designed for the induction motor which has a constant speed.

Standby Units in Large Plants

When the capacity of the plant is 4,000,000 gallons per day or upward the question of standby units becomes a much larger problem than for the smaller plant; because, to take care of the capacity of the plant, it is necessary to place in the pump house several gasoline engine driven units and these units to start and to keep in operation require the close attention of an operator; and it is doubtful if it is good practice to put more than two or three such units in the pump house and expect one man to look after their operation. About the largest pump which can be driven by the largest commercial gasoline engine is one to give 3,000 g.p.m. against 100 lbs. pressure. This unit would require an 8-cylinder gasoline engine of about 250 h.p. at 1,300 r.p.m.

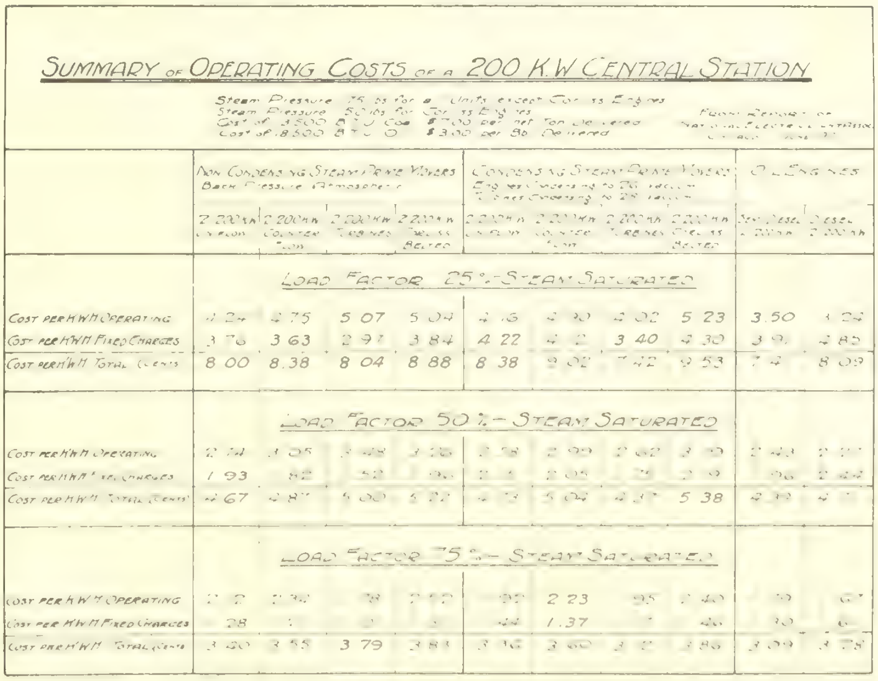
In order to take care of standby units in these larger plants either one of the following methods must be followed:

1. Steam driven reciprocating pumps or steam turbine driven centrifugal pumps.
2. Steam drive generating set to generate electricity to drive the electrical equipment.
3. Crude oil engine of the diesel or semi-diesel type driving an electrical generator to supply power for the electrical equipment or directly connected to centrifugal pumps by means of gearing.

If steam equipment is used the question of banking fires is the big operating expense. If the boilers are water tube boilers this can be easily taken care of by installing a small donkey boiler which will act as a water heater and keep the water temperature in the water tube boilers around 200 degrees so that in case of emergency the steam pressure can be quickly brought up to the desired point by putting fires under the boilers. If this equipment be oil fired it will not be necessary for the plant to maintain a staff of firemen and when the emergency arises the oil burners can be lighted under the boilers and steam pressure secured in a very few minutes. The cost of operation of standby units in this manner can be reduced to a mimimum.

Economy of Diesel Engines

The diesel and semi-diesel engines are very economical in operation and consume about 1/2 pint of crude oil per h.p. per hour. This oil can be bought for about 10c per gallon and the engine, if kept in good condition, can be very quickly started. The advantage of this type of equipment lies in the fact that it is not necessary to maintain a continuous consumption of fuel as in the steam plant. The capital cost of the steam and diesel equipment runs so high that the gasoline engine driven equipment can be oper-



SUMMARY OF OPERATING COSTS OF A 200 K.W CENTRAL STATION

Steam Pressure 75 lbs for all Units except Corliss Engines
Steam Pressure 50 lbs for Corliss Engines
Cost of 13500 B.T.U. Coal $7.00 per net Ton Delivered
Cost of 18500 B.T.U. Oil $3.00 per Bbl. Delivered

From Report of National Electric Light Association [illegible]

	Non Condensing Steam Prime Movers Back Pressure Atmospheric				Condensing Steam Prime Movers Engines Condensing to 26" vacuum Turbines Condensing to 28" vacuum				Oil Engines	
	2 200 KW Uniflow	2 200 KW Counter Flow	2 200 KW Turbines	2 200 KW Corliss Belted	2 200 KW Uniflow	2 200 KW Counter Flow	2 200 KW Turbines	2 200 KW Corliss Belted	Semi Diesel 2 200 KW	Diesel 2 200 KW
	LOAD FACTOR 25% — STEAM SATURATED									
Cost per KWH Operating	4 24	4 75	5 07	5 04	4 16	4 90	4 02	5 23	3.50	[illegible]
Cost per KWH Fixed Charges	3 76	3 63	2 97	3 84	4 22	[illegible]	3 40	4 30	[illegible]	4 85
Cost per KWH Total Cents	8 00	8.38	8 04	8 88	8 38	9 02	7 42	9 53	[illegible]	8 09
	LOAD FACTOR 50% — STEAM SATURATED									
Cost per KWH Operating	[illegible]	3 05	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cost per KWH Fixed Charges	1 93	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cost per KWH Total Cents	4 67	[illegible]	[illegible]	[illegible]	[illegible]	5 04	[illegible]	5 38	[illegible]	[illegible]
	LOAD FACTOR 75% — STEAM SATURATED									
Cost per KWH Operating	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2 23	[illegible]	[illegible]	[illegible]	[illegible]
Cost per KWH Fixed Charges	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.37	[illegible]	[illegible]	[illegible]	[illegible]
Cost per KWH Total Cents	[illegible]	3 55	3 79	[illegible]	[illegible]	3 60	[illegible]	3 86	[illegible]	[illegible]

Fig. 2—Operating costs of a 200 k.w. central station based on load factors of 25, 50 and 75%.

ment for a long period before the combined operating and capital costs are equal. In figuring a specific case it was found that the gasoline engine driven equipment could be operated for 30 days and at that time the combined operating and capital cost would be equal for the two types of equipment.

The semi-diesel type engine is considerably cheaper per h.p. than the diesel although the diesel type shows a decided advantage in fuel consumption over the semi-diesel.

If steam equipment is maintained in the pump house it is found desirable, from an operating cost view point, to keep in continuous operation a small steam driven unit so that the steam which is generated may be used to some good purpose. Most waterworks plants have certain specific conditions as to capacity of units, size of boilers, etc., and the economic operating point for a combination of electric and steam units can only be obtained by experimentation.

In June, 1921, the National Electric Light Association printed a pamphlet called "Small Steam Prime Movers" in which the capital cost and operating costs of various units were figured out in detail by a committee of experienced engineers. Table No. 1, which is given below and which is copied from this report gives the capital and operating cost of these units and gives the operating cost based on load factors of 25, 50 and 75%. It will not be necessary to go into the detailed figures of computations. They are based on the assumption given in the table and assume a spare unit. These serve to give a comparative statement of the cost of operation of the various units and can be considered as reliable figures upon which to pass an opinion as to the most economical type of equipment. It is not probable that any standby units would be used with as high a load factor as 25%, but the figures will be interesting to show a comparison between the different units when operating at various factors. No doubt, if one considers these units as idle units, except in the case of emergency the unit with the lowest fixed charge, namely the semi-diesel engine, would be the cheapest, and it is interesting to note that for a continuous operation the semi-diesel engine is as low as any other unit.

In calculating operating costs of standby units one must assume some basis as to the number of interruptions and the length of these interruptions to the hydro-electric energy throughout the year. With very few exceptions, the interruptions to hydro-electric energy are comparatively short and very seldom run over a two hour period.

Reservoir to Counteract Power Interruptions

In all waterworks plants operated by electrical energy there should be an elevated reservoir containing a sufficient supply of water to carry the system over the short periods of interruptions of power and enable the standby unit to be put in operation without interfering with the pressure. A good basis for figuring the size of these reservoirs would be to figure a one-half day supply for the smaller systems and a 1/2 million to a million gallons supply for the larger systems. There is a tremendous strain placed upon the distribution system due to water hammer when the power is cut off if there is not an elevated reservoir to maintain a pressure on the system.

Having in mind the comparatively short time that a standby unit would be called upon and the large expenditure which is necessitated due to installation of such units, the question of duplicate power units is a serious one where there are waterworks systems which are called upon for large daily supplies of water and it is very doubtful if one could improve upon an installation of a semi-diesel oil driven engine direct connected to a generator to supply power in an emergency for the motors of the pumps. A plant of this nature has very wide possibilities in the average small city because during normal periods of consumption there would be a considerable amount of electrical energy available for other purposes and quite possibly without too much extra expense enough energy could be supplied to take care of the street lighting as well as the domestic supply of water; and, if these two problems could be worked out together, the question of heavy charges against the waterworks plant might be relieved to a considerable extent by the street lighting bearing a portion of the cost.

In order to give an idea of the cost of gasoline engine driven units a centrifugal pump of 4 million g.p.d. capacity against 230 foot head connected to a G.R.C. 8 Sterling engine costs f.o.b. factory about $7,000.00, or figuring pump and engine together the cost per h.p. is about $25,00. The cost per h.p. for a semi-diesel oil engine is about $100.00.

This paper does not take into consideration the condition where alternate sources of electrical energy are available or where hydraulic power is possible. These are ideal standby units and those waterworks plants so situated are fortunate.

Progressive House Building Plan Being Undertaken in East Toronto

A novel scheme of building is being undertaken in the eastern part of the city of Toronto, Ont., in the erection by a local builder of a hundred houses on a house-a-day plan. Though the present lot of new residences was only recently undertaken, the scheme of the builder and owner, H. Addison Johnston, has proved a success. Eight of the houses were finished to the roof in one week. Various stages in the progress of construction of a row of six-roomed, solid brick, semi-detached bungalows are now in evidence on Larchmount avenue, a new street east of Pape avenue and running south of Queen street. The property is interesting in its presentation of excavations, partial foundations, complete foundations, houses displaying the ground floor only, the walls partially constructed, or the roof in the course of construction and others completely finished.

Building operations which began the first of April following the purchase of 1,600 feet of land started with the excavating of a 730-foot trench along the west side of Larchmount avenue by the steam shovel. The delivery of more than a quarter of a million of bricks directly into the excavation filled the trench, and a gang of bricklayers, sufficient to put up one house per day, began the task of building. A gang of carpenters immediately followed on the job, laying joists and rough flooring. In this wholesale construction of houses each gang of workmen is allotted a particular portion of labor, which will enable them to complete their work for one house in an ordinary working day. Drains, plumbing and furnace pipes are installed and sash fitted as soon as the roof is on the bungalow. Electric wiring, lathing and plastering follow, though a little time is necessarily lost while the brown plastering is drying. The house is trimmed immediately upon the drying of the finished coat of plastering. The trim, which has been previously cut, sand-papered and stained, is added to the house and upon the completion of this work stairs and balusters are built in. Doors are hung, locks fitted, the oak floors are laid and the house turned over to the painter.

Work is Progressive

While gangs of bricklayers and rough carpenters are carrying on with the outside construction of the later bungalows, the details in the completion of the houses first built are carried on by other workmen. These details include the finishing tasks of electricians, carpenters, furnace men, tinsmiths and plumbers. The grading of lawns and filling in of passages between houses is accomplished simultaneously with the latter part of construction. A small electrically-driven woodworking plant installed on the premises, greatly facilitates the work of the carpenters in rapidly sawing and cutting the various pieces of lumber required in the work.

It is anticipated that the 100 houses, now under construction, will be finished at the end of July. Upon their completion Mr. Johnston will immediately begin the construction of a second group of 100 small houses.

New Scheme for Bonding Contractors

A Suggested Method by Which Irresponsible Bidders Will be Eliminated from the Competition for Construction Work—Defects of the Present System

By L. E. STARK

At the Associated General Contractors' Annual Meeting

The irresponsible bidder and his elimination is a problem. There are several fundamental principles which must be borne in mind at all times and in connection with all problems. We live in a free country where all men have the right to engage in any lawful business or enterprise, where competition is encouraged, and where any agreement, arrangement, plan or scheme which eliminates or discourages competition is against public policy and unlawful.

In considering this subject, it is not our purpose to violate any of these fundamental rights or principles or to violate any other principle of public policy or the law. It is our purpose to discuss ways and means whereby we may eliminate those who are, because of lack of qualifications, financial responsibility or for other reasons, not capable of doing the things which they are attempting to do and which they are contracting to do.

Owner Often Pays Dearly for Low Bids

It is only natural that people desire to keep the cost of the construction of their buildings as low as possible. The low bid is usually attractive to them, but there are many cases where the low bid turns out to be an extremely high one. I mention this for the reason that, from past experience, you have learned that a person about to let a contract for the construction of a building at times allows desire for a low figure to influence him to the extent of not thoroughly considering the bid, which may be ridiculously low, and he does not thoroughly consider who the bidder is, does not investigate his skill, fitness or qualifications, his past experience or his financial responsibility, and therefore does not consider whether or not in the end the work, if let to the low bidder, will be completed by him. The irresponsible bidder, as you well know, in many cases is so hungry for work or is so unqualified to properly figure a job that he may be low. If the contract be awarded to him, many times he is not able to complete the building because of lack of skill or means and it is necessary to turn the completion of the work over to someone else, which always involves much delay, additional expense and considerable grief, and usually a job covered with mechanics' liens. But possibly the most important of all is that, because of the lack of skill and fitness, the character of the work is such that the owner has paid dearly for what he has received. This is one phase of the problems growing out of the irresponsible bidder.

Unfortunately the irresponsible bidder and contractor reflects upon the responsible and reputable ones and the construction industry. By eliminating him, the best interests of all are subserved, including not only the responsible contractors and the owner, but in the long run the irresponsible bidder himself.

The architects, no doubt, are as much interested in eliminating irresponsible bidders as the contractors are and it will be necessary to receive the co-operation of the architects in working out any method which may be adopted to eliminate the irresponsible bidder.

Checks—Bonds—References

One method which might tend to eliminate the irresponsible bidder would be through the requirement of a certified check accompanying the bid of such size that one who is not financially responsible could not furnish same. It would eliminate those who are financially irresponsible, but would not eliminate those who are irresponsible because of inexperience or lack of skill or other qualifications. I do not advocate this, for I do not think it would constitute a complete method, furthermore, it would hardly be satisfactory to contractors as a whole for the reason that, no matter how large or small or responsible the contractor may be, he needs his working capital and does not want to tie it up and have it lying in deposits or certified checks here and there.

I have recently been furnished with a copy of an advertisement for bids and notice to contractors, which was prepared by W. F. Gernandt, a well-known and very competent architect at Omaha, Neb., in which there are some unusual and meritorious requirements which may have the effect of eliminating irresponsible bidders, while the responsible bidder cannot in any way object to them. The requirements made by Mr. [illegible] provide that a certified check must accompany each bid, which checks are not to be exhorbitant but of a fair amount; also that each proposal be accompanied by an original letter from a bonding company or surety, stating that the bond will be furnished to the bidder promptly upon the awarding of the contract; in addition letters of reference are required to endorse the qualification and experience of the bidders for the work they are bidding upon. These requirements, it seems to me, raise the standard and will, no doubt, discourage some from bidding and possibly eliminate some who do bid on the work. There are certain surety companies, however, which occupy the same position among surety companies as the irresponsible bidder occupies among the contractors, and while certain contractors cannot obtain bonds from the conservative and substantial surety companies, they do seem to be able to obtain bonds from certain other surety companies, who apparently are willing to bond almost anyone. While these surety companies are qualified under the laws of the several states to do business, nevertheless we have seen many of them become insolvent and go out of business to the great detriment of those who were relying upon them as sureties, so that I feel that the requirements should go considerably further.

A New Plan

My plan for eliminating the irresponsible bidder, I believe, is perfectly valid and lawful and could be used on both public and private work. It would require the co-operation of the architects. It does not eliminate or stifle competition, gives every one a chance to bid under the same conditions, and is eminently fair in that it should fully protect a prospective owner, as no bids would be considered other than those submitted by responsible bidders and the irresponsible bidder would be automatically eliminated. I propose that, to every set of plans and specifications furnished by the architect to the contractor for the purpose of estimating the job, there should be attached a notice stating specifically under what terms and conditions the bids are to be made and received. The notice to the bidder should require that a certified check of a fair and reasonable amount must accompany each proposal, with the usual provisions of forfeiture of said check on failure to enter into contract. The notice and conditions should require a surety bond to cover the faithful performance of the work and should further require that the proposal be accompanied by an original letter of a bonding company or surety, authorized to do business in the state, stating that the required bond will be furnished to the bidder promptly upon the award of the contract together with a detailed financial statement of the bonding company or surety.

Complete Financial Statement

The notice and conditions thereunder should further require that the proposal be accompanied by a full and complete financial statement of the contractor upon a form furnished by the architect, which form should require the contractor to state the number of years he has been engaged for himself in the construction business; what experience he has had in connection with the construction industry, and over what period of years; a complete list of his assets setting out in full of what the assets consist, so that same can be investigated and it can be ascertained whether they are sound and quick assets or slow assets; a complete list of his liabilities; whether the bidder is an individual, partnership or corporation; if a partnership, a complete financial statement of each partner, as well as the partnership; a complete list of his equipment; a list of at least three jobs which he has successfully constructed during the three years prior thereto, the nature of each job, and the contract price of each, and the name of one or more jobs which he has successfully constructed similar to the one upon which he is bidding; a reference to three persons for whom he has successfully constructed work, and a general reference to three other substantial business men where he resides; a statement as to how much available working capital he has on hand to prosecute the work, and the notice and conditions thereunder to the bidders should state that all bidders must have on hand working capital amounting to at least 20 per cent. of the total bid. The financial statement should be signed and sworn by the bidders.

The instructions to the bidders should also specify that the bid is to be enclosed in a sealed envelope, the financial statement of the bidder and the letter and financial statement of the bonding company to accompany same, but to be separate and apart from the sealed bid. The notice to the bidder which accompanies the plan and specifications should also state that the financial statement and letters from bonding companies will be first inspected, and that the only bids which will be opened and considered will be those which are accompanied by a financial statement showing the proposed bidder to be sound financially, to have sufficient equipment, to have sufficient qualifications and experience to carry on the work, to have on hand working capital of at least 20 per cent. of the amount of his total bid, and that a bonding company which is sound financially is ready to write the bond. This plan combines all of the requirements which are not in practical use together with a few ideas which I have conceived; and, if such a plan should be adopted and put into practical use, the bids of irresponsible contractors would never be even opened or considered, for the statements accompanying same, which would be first inspected, would show whether they possessed skill, integrity and responsibility, all three of which are essential. I can see nothing in these requirements which a reputable contractor would object to or which would be in any manner burdensome.

Limited Finances

There are men engaged in business as general contractors who have technical education and training and years of experience in construction work, who are skilled and without question are competent to undertake the construction of almost any work, but who are not financially in shape to undertake large work; and some of the contractors who come within this class may object to what I am proposing. However, no matter what skill and experience they may possess, they have no business undertaking contracts which they have not sufficient finances to carry on and complete. Contractors in this class would be responsible bidders for work which they had sufficient funds to finance, but would be irresponsible bidders, on work which was beyond their means. If they can, for a particular job, make special arrangements for sufficient funds to finance the job, they then could qualify and their bid would then be considered.

Hints for the Contractor

Timber Lattice Work

The accompanying sketches show the process employed for making lattice work out of a solid board. Fig. 1 shows the first operation of the method which consists in making series of parallel saw cuts through a board. This is done by dropping the board over the saws making first the centre cuts (3); the operation is repeated for the end cuts (4), after which the sawn board is expanded as shown in Fig. 2. This process is patented in Canada.

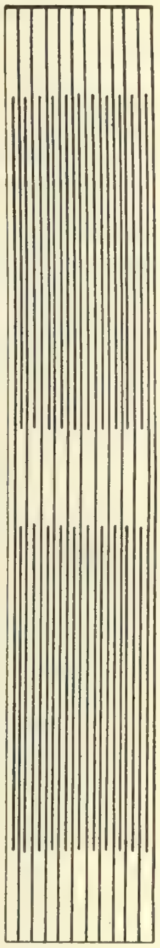


Fig. 1

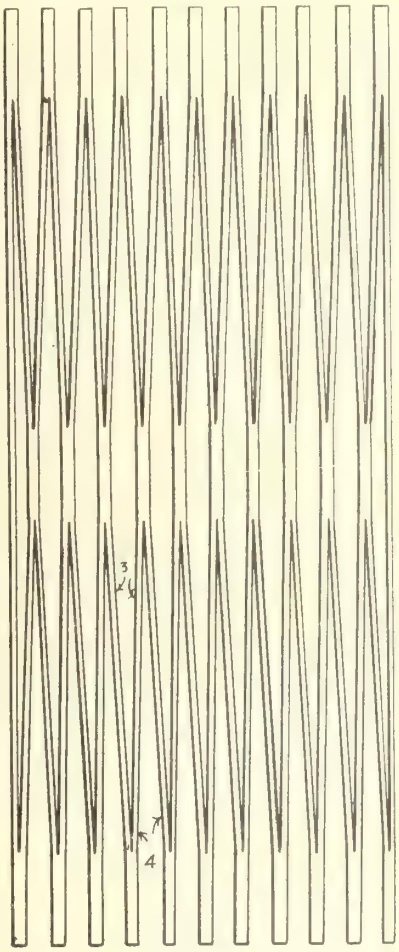


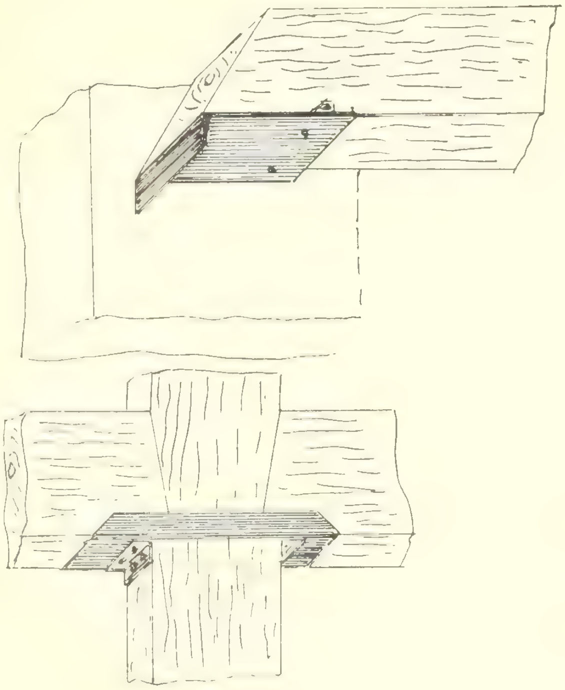
Fig. 2

Home Made Post Caps and Wall Plates

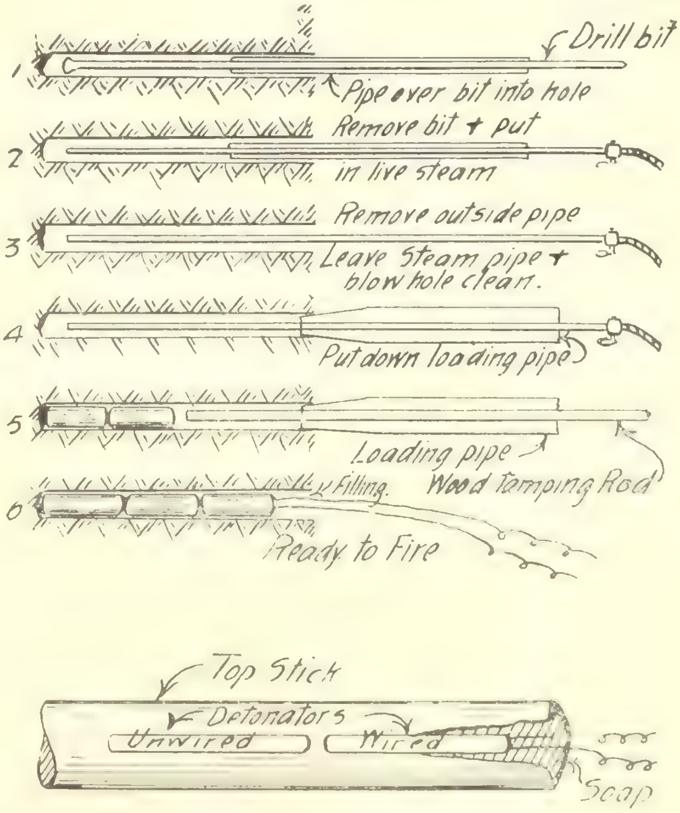
In nearly all of our structural steel yards are seen waste ends of girders, channels, angle iron, which can be made up on short notice into one-way post caps for standard mill construction, and wall plates as shown by the sketches. Base plates can also be made from short ends of plate of different thicknesses, with angle irons rivetted to same to suit the sizes of posts to be used.

On looking at the sketch as shown, the post caps

(Continued on next page)


Post caps and wall plates made from odds and ends of structural steel

Loading and Firing Methods for Submarine Work



The diagrams are self-explanatory

Home-made Post Caps and Wall Beams

(Continued from page 481)

are made of waste ends of channels to suit the size of wooden posts and beams to be used. To secure the caps to the posts, angles are rivetted to the under side with holes punched through which to lag screw to the posts. In making wall plates, one of the flanges of the channel is cut off flush the other flange acting as anchorage in brickwork. A 1 inch square bar is flush rivetted on the top side, the wooden beams being notched out to provide anchorage for the beam as shown. These channels make a very snug fit, as beams are generally half an inch smaller than nominal sizes, this allowing for thickness of flanges being taken off in widths. With the making of strap hangers for beams or joists, all the requirements for a mill constructed building could be made up at the steel yard, and supplied to the job without any of the usual delay and at much less cost.

Letters to the Editor

Integral Water-proofing

Toronto, Ont., May 14th, 1923.

Editor, Contract Record:

Dear Sir:—

Referring to an article by Mr. Samuel R. T. Very on "Integral Waterproofing Compounds" entitled "Is Integral Waterproofing Desirable?" in your issue of May 9th, page 437 et sequae.

The opening paragraphs of this article inspire one with the hope that here at last is someone who has tackled this problem in a practical way, confidence and interest awakened, only I regret to say, to be sand bagged later in the article.

Mr. Very describes a method of test which, in the opinion of the writer, is not an approximation to field conditions either for concrete or stucco.

What practical relations exist between the methods employed in moulding the test specimens and the field methods used in applying stucco on a vertical wall? What practical relation exists between the curing conditions of the test specimens, kept a month or more under wet blotting paper and seven months carefully wrapped up in paper, and the curing conditions of stucco in the field, protected perhaps for a week and then directly exposed to the weather? In what way can the behaviour of such test specimens when exposed to a water pressure of 50 lbs. per square inch, be interpreted as a forecast of the behaviour of field stucco exposed to the weather?

As related to concrete, what possible value are the tests if compression is not considered? As related to stucco, why was not tensile strength taken into account, a very highly important factor?

We must hesitate to accept Mr. Very's conclusions under "What Integral Waterproofings Do" as justified by results of the test.

In what way does the use of integral waterproofing compound ensure that the workmen will "pay more attention to proper grading, mixing, tempering and placing of concrete and stucco?" What facts were determined which justify the conclusion that "They undoubtedly do bodily replace some of the imperceptible pores in even the best field specimens?" How was the increased colloidal efficiency of the cement evidenced? In what way was their catalytic action recognizable?

The only reference to hair cracks in the description of the tests appears in connection with four of the "Waterproofed" specimens representative of all of the classes of compounds tested; yet Mr. Very assures us that as a result of his test there is no doubt in his mind that the lack of integral waterproofing is responsible for the development of hair cracks.

It is as well to point out that a mortar of a highly impermeable nature is not necessarily non-absorbent and it is non-absorption that is sought for in stuccos as well as concretes.

The deduction must be that, while Mr. Very has no doubt satisfied himself, he will not have satisfied any architect or engineer who thoroughly analyses the test methods and results as described in the article under discussion.

Yours very truly,
W. L. R. Lewis,
M.E.I.C.

Colonel Boyden Speaks to Ottawa Engineers

Lieut.-Col. M. C. Boyden, M.A.S.C.E., in his lecture before the Ottawa branch of the Engineering Institute of Canada, at its last meeting for this season, in the lecture hall of the Victoria Memorial Museum on May 14, laid strong emphasis on the saving of public funds already invested or to be invested in highways as a duty and problem confronting the engineering profession. The lecture was replete with information and statistics of importance to the road builder. At the close of his talk Mr. Boyden showed some slides illustrative of the effect of traffic over several test roads in the United States.

An investment can be safeguarded in two ways, he said: first, by so constructing that the best possible value shall be obtained for each dollar spent, and second, by so maintaining the construction of the structure in which the investment is made that the maximum possible life of the structure shall be obtained. Col. Boyden urged the first method as being the most effective.

Referring to the investigations in the sphere of concrete road construction, which have been recently made, he said that "due to a realization that the enormous investment in streets and highways being made each year must be safeguarded, a number of serious and expensive large-scale investigations have been started in the United States. These tests have already cost over a million dollars, and are being financed by the national government, state highway commissions, private corporations and universities." These investigations have made possible some valuable deductions affecting the design and construction of concrete surfaces, he said.

John Inglis Co. Will Supply Boilers

The city of Winnipeg Hydro-electric System, which recently decided to install a stand-by steam plant, have awarded the contract for the boilers. These will be built and installed by the John Inglis Co., Toronto. The equipment consists of three 1,100 h.p. Erie City type, vertical water tube boilers, 240 lbs. pressure per square inch.

Does Natural Lighting in Buildings Pay?*

Daylight is Expensive when the Cost of All the Items Involved is Taken into Consideration—Comparisons in Connection with Standard Types of Buildings

By M. LUCKIESH and L. L. HOLLADAY†

In the study of lighting it must often occur to some of us that natural lighting costs something, still relatively few persons appear to be conscious of its cost. How often does the consumer of artificial light bring up the question of cost without even hinting of applying this unwelcome characteristic to natural lighting! In fact, many times we have been met with the statement that natural light "costs nothing." This is true quite generally outdoors but is rarely true indoors. Many items contribute to the cost of natural lighting such as the greater cost of constructing windows and roof skylights than plain walls and roofs respectively; the cleaning and replacement of glass; the greater loss of heat from glass areas than from ordinary walls and ceilings; the valuable wall-space and ground area consumed by windows and light courts respectively; and various other factors. Furthermore, natural lighting fails at the end of each day and is often inadequate during the day and its distribution in interiors is not often ideal.

Natural Lighting is Often Costly

The cost of natural lighting is of interest to everyone if for no other reason than that its recognition tends to make us more lenient toward our artificial lighting bills. But the cost of natural lighting and certain undesirable characteristics such as undependability, difficulty of control and its inadequacy in congested districts afford questions of real economic interest. Where land values are extremely high, light courts and even windows place a burden upon natural lighting worthy of consideration from an economic standpoint. Of course, we must have ventilation in buildings, but the present areas of windows and of light courts are usually more than adequate. In fact, artificial ventilation is practised to some extent and can serve us adequately and oft-times better without depending upon natural lighting openings.

But it is not the aim of this paper to discuss the advantages and disadvantages of natural lighting. Such a discussion would lead far afield and would finally become entangled in opinions and speculations. The aim is to compare the cost of natural lighting with that of artificial lighting.

Not having seen any data published by architects we have set ourselves the task of making certain computations and estimates, assuming what we believe to be representative cases and avoiding extreme cases. The results certainly indicate approximately the costs of artificial and of natural lighting. From them it is seen that the cost of natural lighting is appreciable. The results show that there are real economic questions to consider in providing natural lighting. As our cities become more congested it appears probable that natural lighting must give way more and more to artificial lighting. Furthermore, in certain buildings we are bold enough to state that natural lighting should be excluded in favor of artificial lighting.

In making these computations, estimates are unavoidable and conditions are extremely variable Therefore the results may not indicate more than a general approximation of the costs. However, the computations were made in great detail, with the intention of conservative judgment, and the data employed in each case are representative of actual existing buildings. We present only a few of the many details of computation but enough, we hope, to enable anyone to criticize or to modify the results in accordance with his judgment. To recapitulate, we make no greater claim for the results than to show the approximate costs of artificial and natural lighting in a number of representative types of modern buildings, such as residences, apartment buildings, office buildings, hotels and other public buildings.

In computing the cost of artificial illumination attention is confined only to electric lighting with incandescent filament lamps.

What the Cost of Natural Light Includes

In estimating the initial cost of natural lighting obtained by means of windows, we include the cost of window frames, sash, glass, accessories, trimmings, installation and painting, less the cost of wall and plaster replaced by the window. To this initial net cost of window is added the cost of extra radiation and heating system required to supply the increased heat loss of window surface over wall area. Overhead skylights are treated in a similar manner.

The annual cost of natural lighting includes the interest of 6% on the net initial cost of windows and heating system, net annual repair and depreciation of windows and additional heating system, the cost of washing of windows and the cost of fuel to supply the additional heat loss.

Strictly the cost of artificial lighting used to reinforce natural lighting in the daytime should be charged to natural lighting, thus reducing the costs of artificial lighting and increasing those of natural lighting. This applies to some extent to all interiors, but this cost has not been charged to natural lighting. However, it is included in the cost of artificial lighting.

We have not included in the cost of natural lighting such items as window shades, the spoilage and cleaning of interiors and furnishings due to dust and to leaks and various related items. We have confined the maintenance charge solely to the window and skylight areas.

Cost of Artificial Electric Lighting

The initial investment of electric lighting includes the cost of electric wiring and cabinets, wall and ceiling fixtures, table and floor lamps, shades and reflectors, and other similar equipment.

The annual cost of electric lighting includes the interest on the initial outlay, depreciation and repairs, lamp renewals, and the cost of electric energy.

The cost of artificial lighting includes even those which could be justly charged to natural lighting when the former is used to reinforce inadequate natural lighting in the daytime. This applies to some extent in all interiors, for example, in basements and closets of residences. In hallways, in offices, in hotel rooms, etc., natural lighting in the daytime is often reinforced by artificial lighting.

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*A paper presented at the annual convention of the Illuminating Engineering Society, Swampscott, Mass.

†Laboratory of Applied Science, Nela Research Laboratories, National Lamp Works of G. E. Co., Cleveland.

I. Seven-Room Frame House With Hot Water Heat

Slightly Above Average Artificial Lighting Equipment

	Natural lighting.	Artificial lighting.
Initial cost of installation	$601	$265
Total annual cost of lighting	93	75

Natural Lighting.—In estimating the cost of natural lighting in residences let us consider first a modern 2-storey frame building, about 27 by 30 ft. plan, which includes a living room, dining room, kitchen, three bedrooms, a bath, hallways, basement and front and back porches. In this house there are 14 windows 36 by 57 ins., six windows 30 by 42 ins., and seven windows 33 by 24 ins., or a total of about 288 sq. ft. of window area. The cost per window for these three sizes are $27.75, $17 and $10.75, respectively, or about $1.95 per sq. ft. of window. Deducting $0.37 per sq. ft. for weatherboarding and plastering replaced by window, the net costs respectively for each size of window are $22.50, $13.75 and $8.70 or about $1.58 per sq. ft. of window. Since there are 288 sq. ft. of window surface, the initial net cost of windows is $455. According to our estimates and assumptions the interest at 6% upon this initial investment of $455 is $27.30; the depreciation at 2.83% is $12.85; the repairs and painting of these 27 windows per year, less the cost of painting the weatherboarding, is about $6.25; and the cost of washing them four times a year is about $11.50. Therefore the total cost of maintaining them is $57.90 per annum.

According to our assumption of temperature differences and radiation our estimates indicate that 0.283 sq. ft. of additional radiation is required for each square foot of window area to supply the net heat loss chargeable to windows. Assuming the cost of a hot water system to be $1.80 per sq. ft. of radiation the initial cost of heating system would be $0.51 per sq. ft. of window, or a total of $146 for the 288 sq. ft. of windows in the house to supply the net heat loss due to windows.

The annual charge for heating these 288 sq. ft. of window area would include interest upon the $146 at 6% or $8.76, depreciation at 3.4% or $4.97, repairs of about $0.82, and the cost of coal at $10.50 per ton when the furnace is operated at half capacity for 7 months of the year or about $20.70; or a total annual cost of supplying heat loss through windows of about $35.25.

On summarizing we obtain the costs of natural lighting presented at the beginning of this section.

Artificial Lighting.—In estimating the cost of lighting this house by electricity let us assume first a meagerly equipped home but somewhat above the average. We assume for this home a ceiling fixture, two portable lamps, and two convenience outlets for the living room; one ceiling fixture, one portable and one convenience outlet for the dining room; one ceiling fixture and one convenience outlet for the kitchen; one ceiling fixture, one portable lamp, and one convenience outlet for each of the bed rooms; two wall brackets in the bathroom, one ceiling fixture and one convenience outlet in the hallway; one ceiling fixture on the porch; three drop cords in the basement. According to our assumption these represent an initial cost of $5 per outlet or $100 for wiring; $100 for fixtures; and $65 for portables; or a total initial cost of $265.

The annual charge against electric lighting includes interest at 6% on the investment equal to $15.90; depreciation on the wiring at 3%, depreciation on the portables at 5%, depreciation on the fixtures at 4% or a total depreciation of $10.25 per annum; an annual repair of $7.90; lamp renewals of $5.35; and the cost of 460 kw-hr. of energy at $0.80 per kw-hr. or $36.80. Therefore the annual cost of electric lighting is $75.20 according to these assumptions. A summary of total costs is presented at the beginning of this section.

II. Seven-Room Brick Vs. Frame House

Same Lighting Equipment as in I.

	Natural Brick.	lighting. Frame.
Initial cost of installation	$505	$601
Total annual cost of lighting	86	93

For a comparison between the costs of lighting a frame and brick residence let us consider a 2-storey brick house of the same size as the frame building, with the same number and area of windows, and an identical lighting plant.

The initial cost per square foot of window is assumed to be $1.95 and the cost per square foot of brick wall replaced by window to be about $0.65, therefore the initial net cost per square foot of window is $1.30 and the initial cost for 288 sq. ft. of windows is $374.

The interest at 6% upon this initial net cost is $22.45; depreciation at $2.83% is $10.60; net repairs and painting is $9.60; and washing is, as before, $11.50. Therefore the annual charge for the 27 windows is $54.15.

The heat loss per square foot of window, 72.1 B.t.u. per hour, is the same for the brick house as the frame house. However the net heat loss per square foot of window is computed to be 44.8 B.t.u. per hour as compared with 49.7 B.t.u. per hour in the case of the frame house. The initial cost of the hot water heating required for supplying the net heat losses from the windows is found to be $131.40 and the annual cost of this additional heat including interest, depreciation, repairs, and fuel is found to be $31.75.

On summarizing we obtain the comparative costs of natural lighting presented at the beginning of this section, for the brick and the frame house.

III. Seven-Room Brick House

Adequate Lighting Equipment

	Natural lighting.	Artificial lighting.
Initial cost of installation	$658	$610
Total annual cost of lighting	111	120

In order to obtain a further comparison of the natural and artificial lighting of residences we have considered a more adequately lighted house. A total window area of 374 sq. ft. is assumed and a more elaborate electric lighting equipment was provided.

Assuming the same conditions as in the previous cases we find the net initial cost of windows to be $486.20. The annual cost consists of the following items: Interest, $29.17; depreciation at 2.83% or $13.75; repairs at 2.5% or $12.15; and washing four times per year or $14.96. The total annual cost of windows is found to be $70.03.

Assuming the same heat losses per square foot the initial cost of heating system to supply the net heat loss is $171.60. The annual cost of supplying the heat loss consists of the following items: Interest, $10.30; depreciation, $5.84; repairs, $0.96; fuel, $24.30. The total annual cost of heating system to supply the net heat loss is $41.40.

This 7-room house equipped for adequate lighting is assumed to have the following equipment. The living room contains a ceiling fixture, one table lamp, one floor lamp, two candle-lamps and four convenience outlets; the dining room contains a ceiling fixture, two wall brackets and one convenience outlet; the kitchen contains a ceiling fixture, a drop cord or wall bracket, and two convenience outlets; each of the three bed rooms contains a ceiling fixture, two small brackets, a table lamp and two convenience outlets; the bath room contains two wall brackets and a convenience outlet; each of the two hallways contains a ceiling fixture and a convenience outlet; each of the two porches contains a ceiling fixture and a convenience outlet; and the basement contains four drop cords and a convenience outlet.

The initial investment in this more adequately equipped 7-room house, therefore, includes the expense of 15 ceiling outlets, 10 wall bracket outlets and 19 convenience outlets, all at $5 per outlet or a total of $220 for electric wiring; it includes $245 for fixtures; and $145 for table and floor lamps; or a total of $610 for electric wiring, fixtures and portables.

The annual cost of the artificial lighting consists of an interest charge of $36.60; depreciation of $23.65; repairs of $6.85; lamp renewals of $5.06, and the cost of 598 kw-hr. of energy at $0.08 per kw-hr. or $47.84 for electric energy. This is a total for electric lighting of $120 per annum.

The summary of costs is presented at the beginning of this section.

IV. Five-Room Brick Apartment

Steam Heated

	Natural lighting.	Artificial lighting.
Initial cost of installation	$225	$230
Total annual cost of lighting	39	65

It is assumed that this steam-heated 5-room apartment has only one-half the window area as the first house considered or 144 sq. ft. and that the electric lighting is meager but representing the average condition.

Using the same assumptions and conditions as in previous cases the initial net cost of the windows is found to be $187.20 and the net annual cost of these windows to be $27.22.

The initial cost of the steam-heating system is assumed to be $1.40 per sq. ft. of radiation. The annual cost per square foot of radiation is computed to be $0.146 including interest, depreciation and repairs; and the cost of fuel is computed to be $0.28 per sq. ft. of radiation per annum. The initial cost of the heating system to supply the net heat loss of the windows is found to be $37.80. The total annual cost to supply the heat losses due to windows is found to be $11.50.

The summary of costs chargeable to natural lighting are presented at the beginning of this article.

In this apartment there are assumed to be five ceiling outlets, two wall brackets, and five convenience outlets which at $7.50 per outlet represent an initial cost of $90 for wiring.

An allowance of $85 is made for fixtures and $55 for brackets making a total initial cost of $230.

The annual cost consists of the following items: Interest, $13.80; depreciation, $9.13; repairs, $2.60; lamp renewals, $3.83; 443 kw-hrs. at $0.08 per kw-hr. or $35.44 for electric energy. This totals $64.80 per year for electric lighting.

V. Modern Hotel; Room and Bath

	Natural lighting.	Artificial lighting.
Initial cost of installation	$161	$115
Total annual cost of lighting	14	14

We assume a hotel in a down town section where real estate is worth $60 per sq. ft.; we assume that the building is 14 stories high; that 13% of the possible floor space is sacrificed for light courts; that the building is one storey high above ground on light courts and covered with sky lights over one-fourth this area. We further assume that a system of heating and ventilation is installed for washing and heating the air.

Assuming the initial cost of a high-class pressed steel frame window is $2.50 per sq. ft., and the brick wall replaced is $0.75 per sq. ft. or a net cost per square foot of $1.75, with interest at 6%, depreciation at 3%, repairs 0.6%, and washing four times per year at $0.01 per sq. ft. the annual cost per square foot becomes $0.208. Assuming a room and bath to have but one 4 by 6-ft. window the initial net cost of window would be $42, and the annual cost of interest, depreciation, repair and washing would be $5.

Assuming an initial cost for the heating and ventilating system of $5.50 per sq. ft. of radiation, and an interest of 6%, depreciation of 3.4%, repairs of 0.6%, and fuel at $7 per ton to operate the heating system at half capacity for 7 months of the year, and electric energy for the ventilating fans at one-fourth the cost of fuel, then the annual cost of operating 1 sq. ft. of radiation becomes $0.80. Since 1 sq. ft. of window is computed to lose a net amount of heat of 44.8 B.t.u. per hour, 1 sq. ft. of window requires 0.187 sq. ft. of radiation. Therefore the initial cost of heating and ventilating systems required per square foot of window is $1.03; and the annual cost for heating 1 sq. ft. of window is $0.15. Therefore the initial net cost of heating and ventilating system for the 24 sq. ft. of window surface for a room and bath is $24.72; and the annual cost is $3.60.

Assuming real estate worth $60 per sq. ft. the building 14 stories high and 13% of possible floor space taken up in light courts, the net cost of real estate per square foot of floor is $0.56. If the room and bath be assumed to contain 168 sq. ft. of floor space, the initial cost of real estate chargeable against light courts is $94.08, and the annual charge for interest at 6% is $5.65.

The large portion of the cost of natural lighting which is due to the area occupied by light courts makes this a matter of concern. Where land values are still higher the cost of light courts becomes even more important.

Summarizing we obtain the costs presented at the beginning of this section.

Assuming that we have one ceiling outlet, two wall bracket outlets and one convenience outlet in each room, and two wall bracket outlets and a convenience outlet in each bath and allowing $10 per outlet we find the initial cost of wiring to be $70. If in addition to the fixtures there is a table lamp we assume an initial cost of fixtures and portables to [illegible] or a total initial cost of electric wiring, fixtures and portables of $115

The total annual charge will consist of a charge of $0.90 for interest, of $2.27 for depreciation, of $1.18 for repairs, of $0.99 for lamp renewals, and a charge for kw-hr. of electric energy at $0.04 or $2.60. These represent an annual cost of $13.94 for electric lighting for a room and bath.

VI. A Suite of Office Rooms

	Natural lighting. Without light-court.	Natural lighting. With light-court.	Artificial lighting.
Initial cost of installation ...	$667	$1,584	$976
Total annual cost of lighting	86	141	290

In such a case as the hallway assumed in this suite, artificial light must be used a considerable portion of the day. This is also true of artificial light in the offices. Strictly, the costs of artificial light to reinforce the natural lighting should be charged against natural lighting. This has not been done but if it had been done the costs of artificial lighting would have been reduced and the costs of natural lighting would have been correspondingly increased.

For a comparison of natural and artificial illumination we have assumed a suite of rooms in an office building consisting of six 14 by 16-ft. offices with three offices on a side and a 7-ft. hallway between. We assume further that each room is illuminated by two 4 by 5-ft. windows and by four 200-watt semi-indirect ceiling fixtures, and that the air for ventilation is washed and heated before being circulated.

Assuming a net initial cost per square foot of window to be $1.75 and its annual cost to be $0.208, we find the initial cost for windows in the whole suite to be $420; and the annual cost to be $49.92.

The heating system necessary to supply the heat losses due to windows assume as in the hotel, to have an initial net cost per square foot of window of $1.03; and the annual cost to be $0.15; therefore, the initial cost of heating system to supply the net loss of heat through windows is $247.20 and the annual cost is $36.

Summarizing we find the costs as presented at the beginning of this section.

Assuming four semi-indirect ceiling fixtures and three convenience outlets in each office and one direct ceiling fixture in the hall, we have at $10 per outlet, a total initial cost of $430 for electric wiring. Assuming, $$22.50 for each office fixture and $6 for the hall fixture we obtain a total initial cost of $546 for fixtures or a total initial cost of wiring and fixtures of [illegible].

The annual cost of electric wiring according to the assumptions and computations consists of $58.56 for interest, of $21.84 for depreciation, of $9.76 for repairs, of $36.90 for lamp renewals, and of the cost of 4080 kw-hr. at $0.04 or $163.20 for electric energy. These represent a total annual cost for a suite of six rooms and hall of $290.26 for artificial lighting.

If we assumed, as in the case of the hotel, that there be an initial cost of $0.56 per sq. ft. of floor area for light courts, the initial cost of natural lighting would be increased by $917.28 and would become $140.96.

The costs are summarized at the beginning of this section.

Conclusion

It is the aim of this paper to present cost data pertaining to natural and artificial (electric) lighting systems for a few representative interiors. In making these computations actual buildings have been used as a basis in each case although in some cases certain minor modifications were made which, in our judgment, made them more generally representative of their class. In the interest of space conservation a vast number of details of computations and estimates have been omitted in the preparation of this paper; however, the chief assumptions and estimates are presented. It should be recognized that conditions upon which costs are based vary considerably but having chosen actual buildings it is thought that the costs presented in the foregoing paragraphs are at least approximate.

It is seen that the cost of natural lighting is of the same order of magnitude as that of artificial electrical lighting in all cases.

It is not suggested that we eliminate windows from residences but is felt that cognizance of the fact that daylight costs are appreciable in residences should make the householder more lenient toward the costs of adequate and proper artificial lighting.

Artificial Light Reinforces Natural Light

In the case of office buildings, hotels, museums and other public buildings, especially in congested districts where land values are excessive, it is seriously suggested as one of the authors has suggested on other occasions, that the cost of natural lighting be given greater consideration in general than in the past. Light courts in many cases contribute a large burden of cost to natural lighting and in many of our offices and hotel rooms they do not provide adequate natural lighting. In other words, during many hours of a year artificial lighting must reinforce natural lighting even in the daytime. But in the foregoing sections this has been charged to natural lighting, but has been borne by artificial lighting.

In many cases windows also contribute much to the cost of natural lighting by utilizing valuable space.

The psychological effect of the absence of windows is well recognized but in our congested cities many persons must work under inadequate, or total absence of daylight. Many night workers gain little or no advantage from windows excepting the psychological effect of "natural" ventilation. If congestion increases, economic considerations will surely compel the reduction of areas of light courts and of windows and will perhaps eliminate them entirely in some cases.

Artificial ventilation and adequate artificial lighting can supply the actual utilitarian demands. It is easy to prove that many interiors existing today would be improved as work places if the outlay for daylight could be applied to the rehabilitation of the artificial lighting.

In some cases, such as museums, there appear to be no defensible reasons for not eliminating the cost of daylight in some of the rooms while the building is being constructed. Adequate and proper means of artificial lighting can be installed, operated, and maintained at costs comparable with and in some cases even less than adequate natural lighting systems. This plan applies particularly to spaces in the central portion of large buildings, and substitutes for more or less undependable natural lighting, readily controlled modern artificial lighting.

The questions involved in substituting artificial lighting for natural lighting are numerous and complex and a discussion of them would lead us far from the objective of this paper.

The Week's Developments in a Nutshell

The chief event of the past week is the new sales tariff. There is much indecision about the interpretation of certain details and some time must elapse before all the contentious points are cleared up, but there seems to be no question whatever about the general intent of the act. It is plainly the desire of the minister that the system of tax collection shall be simplified. To this end he now proposes that the tax shall be the same on all sales, viz. 6%, and that there shall be no pyramiding, i.e., no tax shall be collected on any commodity more than once. The point at which the tax shall be collected is its final stage of manufacture. For example, lumber sold to the building contractor will be taxed when it leaves the wholesaler; if sold to a sash and door factory, a furniture factory or for other manufacturing uses, it is not taxed; it is the furniture, the sash and the doors—final products—that carry the tax. In the same way steel for structural building, reinforcements, etc., will be taxed, but steel that is to be used in the manufacture of generators, transformers, automobiles, concrete mixers or whatnot, will pay no tax. In this case again the final product will collect the 6%.

So far as one can judge at the moment the proposed individual tax is no greater than the multiplicity of taxes previously imposed. In some cases it will work out rather less. The difficulty of interpretation is already evident, however, as in certain lines it is hard to say just who is a manufacturer. A carpenter contractor, for example, may undertake to 'manufacture' a set of bookshelves for a house he is building, or a sideboard or kitchen cupboard; a wiring contractor may assemble his lighting fixtures; a municipality may manufacture its own cement tile and so on. It is evident that the bookkeeping system that will keep all the items in their proper place will be quite a complicated one still.

It is for these reasons that moves are already under way to have the collection of the tax further simplified. For example, the lumber associations are suggesting that all the tax in that industry be placed on the sawmill product—boards, timbers, etc. In the main, however, the suggested method of collection has met with favorable comment. Doubtless the little difficulties will be ironed out.

The building trend is that materials remain practically steady with a tendency towards higher costs of labor. Examples of this trend are shown in the demands of steel workers of the British Empire Steel Corporation for a 30% increase and an eight hour day. Lathers in Toronto have struck for an increase from $1.00 to $1.25 an hour. In this connection it is interesting to note the statement that in the United States lathers are getting as high as $17 a day. This further indicates the extent to which the "boom" has taken hold south of the line. It also indicates in reverse proportion the relative stability of conditions in the two countries. While discussing the labor situation it is worth noting that unemployment is gradually disappearing in England. The latest report states that there are a quarter of a million more men working today than a year ago.

There are further signs that the peak of building activities has been reached in the United States. Several large pieces of construction are reported as being indefinitely postponed on account of high costs and financial institutions are issuing warning messages. The stock markets of that country have been decidedly depressed and though it is claimed by some of the optimists that this is mostly a temporary back swing and that there will be another big upturn, there are many operators who believe that stocks have started downhill permanently.

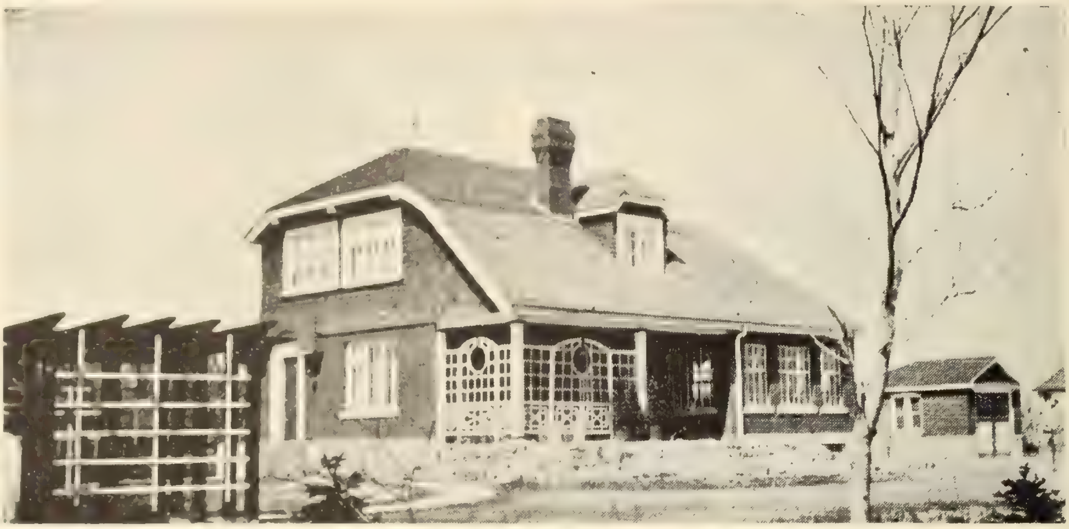
In Canada, the setback of the past few weeks has been very small by comparison. It is an excellent sign of a stabilized condition when Canadian stocks are scarcely affected at all by New York alarms.

There is perhaps a greater aggregate of building under way in the Dominion today than at any previous date in our history. With such projects as the Drummond apartments in Montreal—the biggest ever built; the Quebec Development Co's hydro-electric plant—representing the biggest order for machinery ever given; the St. Maurice Power Co's development; the Queenstown extensions of the Ontario Hydro; Trinity University; the T.T.C. car shops; the Welland Canal; the Manitoba Power Plant; the Imperial Oil Co's refinery in Calgary; the Esquimalt dry dock; the Ballantyne Pier—all running into millions—with hundreds in only slightly smaller figures, to say nothing of a very large house building programme, there seems to be nothing in the way of continued steady activity—if we can keep labor and materials from going higher.

Price changes of material have been limited in number and extent. Steel for builders' purposes, which has been the most active item in the builders' supplies market this season in the Toronto district, has shown no further change since the general advance reported last week, although there is nothing to indicate that prices will remain at this level for any considerable time.

The only change noted within the past week in the lumber market is an advance of $10 per M in the cost of plain red oak flooring, 3/8" clear, the present price being $140 per M.

Brick and cement prices continue steady, as do the other materials in this market, such as stone, sand, gravel, lime, plaster, paints, etc.

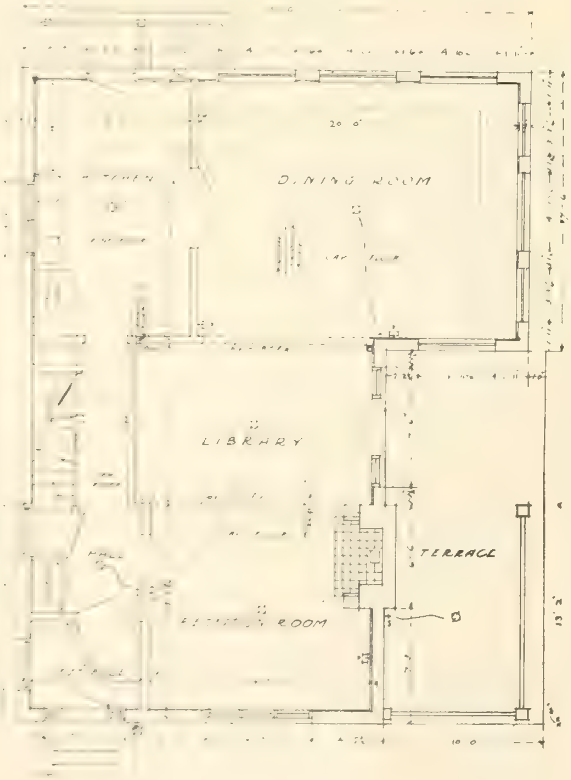


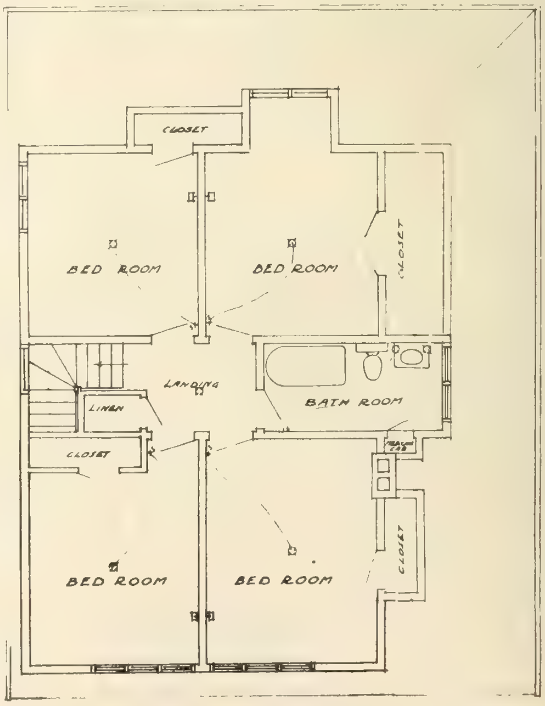
Weekly House Suggestion No. 69

In the pretty little home we are showing this week built in Toronto recently, a bungalow effect has been obtained by bringing the roof down over the porch and the sunroom. The general construction is of Cooksville shale brick in tones of buff and brown, to the second floor, with stained shingles on brickwork above and shingle roofing. The foundation walls are of stone and the window sills are of limestone. The roomy porch at the side is enclosed with a specially designed and very attractive lattice work and is floored with red quarry tile.

The flooring and trim on the first floor is of oak; the bathroom is trimmed in white pine and the remainder of the second floor is in chestnut, stained, with oak floors. The reception room, dining room and living room have coved ceilings, the plastering being of a rough Portland cement stucco. There is a handsome brick mantel in the living room and a new and very attractive feature of the dining room trim is the construction of a tray shelf along the south and east walls 28 in. and 20 in. wide respectively to the level of the window boards, lined with copper and filled with small pebbles, where potted plants are kept the year round.

Mr. J. W. Siddall, architect, Confederation Life Bldg., Toronto, is the designer of this very attractive residence and the contractors were W. H. Martin & Co., specialists in house construction, of 28 Harcourt Ave., Toronto.





Canadian Concrete Mixers on Big English Stadium

Wettlaufer Bros. Limited, Toronto, makers of concrete machinery and contractors equipment, report that they have just received a cable from Birmingham, England, for six of their O-Power mixers. This is the second order cabled within eleven days. The record of these machines on the big Aston Villa Stadium has won considerable business for this firm. The O-Power outfits were used not only in finishing up work on this big job but also in mixing cement mortar.

Mainly Constructional

East and West—From Coast to Coast

There is a possibility of another large hospital building in Toronto in the near future. A fund of $100,000 is available for this purpose, a bequest of the late William Hill, and the Board of Control have decided to recommend that the promoters be provided with a free site for the building, provided they raise a fund of $250,000. The location would be in the Riverdale district.

Building continues brisk in York County, Ont., permits totalling $660,000 in value were issued during the first two weeks of May and indications are that last year's record figure of $1,560,000 for the month of May will be about equalled this year, despite the fact that North York Township in York proper, is not included in this year's total.

City Engineer F. Shupe, of Kitchener, Ont., has recommended, in a recent report, the installation of an activated sludge sewer system for the Spring St. section of the city, to cost $83,000. The plans for this system have been approved by a prominent Toronto sewage engineer .

The steel workers at Sydney, N. S., have made the following demands on the British Empire Steel Corporation: (1) A 30 per cent wage increase; (2) the eight hour day; (3) Recognition of union and adoption of the check off system of collecting union dues.

Within the past month, it is reported, 125 union carpenters, from Glasgow and other points in Scotland, have arrived at Toronto and deposited their cards with the local Carpenters' Union.

A start is to be made immediately on the rebuilding of the Sparks Street Chambers, Ottawa, destroyed by fire recently. The new building will be five storeys high, of modern construction and will cost about $100,000. The old walls having been declared sound will be utilized and extended one storey.

After a period of inactivity lasting nearly three years, the Port Credit Brick Works, Port Credit, Ont., has re-commenced operations. The plant has been completely remodelled, and will produce pressed brick. A force of about 150 men are employed.

Grants to Western University London, Ont., totaling $600,000 passed the Legislature under supplementary estimates, without opposition. Of the amount $400,000 is for buildings.

A body of prominent business men at Collingwood, Ont., has been organized to help the movement for the establishing of the proposed Blue Water Highway. Mayor Arthur is president of the body.

The construction of a $500,000 cold storage warehouse at the port of Quebec is under consideration by the local board of trade and harbor commission. It is expected that the Federal Government would be willing to make a loan of the above sum for this purpose.

The property owners of the municipality of Sillery, P.Q., which includes Bergerville, recently passed a by-law authorizing a water works and sewerage system for the municipality. The cost of the sewerage system is not to exceed $85,000, while the water works will be installed by a contractor at his own expense, who will charge $12 a year for the first tap and $3 a year for each additional tap, also $4 a year for each water closet. A clause in the contract for the latter scheme provides that the city will have the option of purchasing the water system from the contractor for cost price plus a 20 per cent bonus, providing the population should increase to such an extent within the next few years that such purchase would be deemed advisable by the city.

After negotiations covering a period of two months, an agreement was signed recently between the Master Plumbers' Association and the Catholic and National Syndicate Plumbers and Steamfitters' Union, at Montreal, calling for an all-round increase of five cents an hour, effective May 1, and to last for two years. The new rates are 75 cents an hour for class A men; 70 cents an hour for class B men, and 65 cents an hour for class C men, the latter scale generally being for first- year men who have served apprenticeships.

The officers elected at the annual meeting of the Peterborough, Ont., branch of the Engineering Institute of Canada, are as follows: Hon. Chairman, P. P. Westbye; chairman, R. L. Dobbin; vice-chairman, E. R. Shirley; secretary, R. C. Flitton; treasurer, A. B. Gates; executive, A L. Killaly, R. B. Rogers, B. L. Barnes, D. L. McLaren, A H. Munro and H. O. Fisk.

Personal

Major E. F. Lynn, D.S.O., M.C., of Toronto, has been appointed chief engineer of Pearson's Limited, an English contracting firm who are building bridges over the Nile, in Egypt. Major Lynn was connected with the Hydro-electric Commission, at Toronto, previous to going overseas with the 2nd Field Co., Canadian Engineers.

Mr. R. A. Garvie, A.M.E.I.C. who was formerly with J. E. Underwood, Consulting Engineer, Saskatoon, has accepted a position with the Acme Steel Goods Co., of Chicago. Mr. Garvie is connected with the engineering branch of the company on design and construction of two new mill buildings.

Obituary

The death of Mr. R. Carr Harris, one of Canada's prominent engineers, took place recently at Bathurst, N. B., at the age of 79 years. His early engineering experience was with the Intercolonial and Canadian Pacific Railway Companies, following which he lectured for nineteen years at the Royal Military College, Kingston, on civil engineering and architecture, and subsequently at Queen's University.

Trade Incorporations

National Dock & Dredging Corporation, Ltd., with head office at Levis, P. Q., capital $95,000, to carry on the business of contracting generally.

Stewart & Hurst Construction Co. Ltd., with head office at Montreal, capital $99,000, to carry on a contracting and engineering business.

Sorel Sand Co. Ltd., with head office at St. Joseph-de-Sorel, P.Q., capital $49,500, to deal in sand, gravel, stone, etc.

CONSTRUCTIONAL ACTIVITY

Period of May 16 to May 22, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Dublin, Ont.

[illegible] Jordan, Clerk of Hibbert Twp., will receive tenders for drainage work for the township, until May 30. This work will include improvements to the [illegible] Drain.

Dundas, Ont.

The Public Utilities Commission, Wm. Mount, Commissioner, may build a new conduit line from the dam at Greensville, West Flamboro Township, to the filter plant at Dundas.

Grimsby Beach, Ont.

Town Council is negotiating for a waterworks extension from Grimsby to Grimsby Beach. Mr. Mitchell, Grimsby, interested.

Hamilton, Ont.

Wentworth County Council contemplates the following roadwork this year: Ancaster Twp., Road 3, Jerseyville west, grading and stoning, $4,000; Road 20, ditching, grading and culverts, $700; Road 15, grading, $900; Road 16, grading and culverts, $1,100; Maintenance and repairs, $5,100. Barton Twp., Road 27, grading, ditching and stoning, $2,000; Road 26, grading, ditching and culverts, $3,000; Road 31, grading, ditching and culverts, $2,000; Maintenance and repairs, $3,270. Beverly Twp., Road 20, grading, ditching and culverts, $2,000; grading for culverts and ½ mile of stone, $2,400; Road 14, Copetown West, grading, ditching and culverts, $2,500; base course, $3,000; repairs to hills, $1,000; P. C. 104, completing 1922 work, $1,500; grading, ditching and culverts, $3,000; Road 2, 1½ miles of gravel across Concession 1, $1,500; Maintenance and repairs, $8,620. Binbrook Twp., Road 22, one mile grading and stoning, $4,800; P.C. 105, grading and ditching, $3,000; Road 26, grading and culverts, $1,200; Road 34, grading, $700; Maintenance and repairs, $5,120. East Flamboro Twp., Road 7, Port Flamboro, Waterdown Bridge and approaches, $9,000; Road 2, Flamboro Village to station, grading and ½ mile of stoning, $3,500; Road 7, Aldershot north, scarifying and rolling, $3,000; Road 37, culvert, $1 200; Maintenance and repairs, $2,000. Glinford Twp., Road 22, grading, ditching and stoning, $3,800; Road 33, grading, ditching and culverts, $1,600; Contingencies, $1,000; Maintenance and repairs, $2,500. Saltfleet Twp., Road 25, base of the mountain to Provincial Highway, light coat of gravel, $900; Road 24, spur to Winona, light coat of gravel and ½ mile of stone, $3,000; grading, $1 000; Maintenance and repairs, $4,110. West Flamboro Twp., Road 5, Bridges 10′ and 12′ span, $2,000; Road 4, 1/3 mile ditching and stone, $2,200; P.C. 104, grading, ditching and culverts, $2,500; Railing and bridges and contingencies, $1,000; Maintenance and repair, $6,740. J. W. Jardine, Court House Hamilton, Clerk of Wentworth County.

The city contemplates laying concrete sidewalks and curbs and the following streets: north side, King St.; east and west sides, Dalewood Cres.; east and west sides, Cline Ave.; north and south sides, Sterling St.; east and west sides, Dromore Cres.; east and west sides, Haddon Cres.; east and west sides, Whitton Rd. and north side, Rowe St.

Islington, Ont.

Stephen Barrett, Town Clerk, will receive tenders for laying approximately seven miles of watermains between Long Branch Park and Etobicoke Creek, for the Township until June 4. James, Proctor & Redfern, Ltd., 36 Toronto St., Toronto, Consulting Engineers. N. McNicol, Township Engineer.

Leaside, Ont.

J. Woodward, Leaside, will receive sealed tenders for the following work until May 25: 2,700 lineal feet of sanitary sewers; 1,700 lineal feet of watermains; main outfall shaft, 6 ft. x 30 ft.

Levis, Que.

The City of Levis will call for tenders shortly for a filtration plant costing $100,000. Lionel Lemieux, City Clerk.

Melbourne, Ont.

Ekfrid Township Council will receive tenders until May 25 for the construction of the Pierce Nicholas Drain. This project will require 9,500 feet of tile. Prices are wanted on all material. A. P. McDougald, clerk.

Moncton, N. B.

The city will lay sidewalks on several streets, commencing June 18. This work will be done by day labor. S. B. Anderson, clerk.

Montreal, Que.

Pavements and sidewalks on the following streets are contemplated by the City and tenders are being received by the City Clerk, Rene Bauset: Pavements—Lebrun, Mercier, Rouen, Papineau, Jeanne-Mance, Northcliffe, Ryde, Knox, St. Charles, Chomedy, Eadie, St. Hubert and Esplanade Sts. Sidewalks—Both sides of Mercier and Cadillac Sts.; one side, Letourneux, Prudhomme, Beaulieu, St. Dennis and Beaconsfield, First Ave., Beaulieu, Cremaizie Blvd., and Terrebonne St.

The City will shortly call tenders for paving the following streets: Prince Arthur, Dublin, Jardin, Mullins, Leber, Messier, Mount Royal, Delorimer, Brisset and Judge. Funds for this project have been voted.

Niagara Falls, Ont.

Stamford Township Council will have three miles of concrete sidewalks, crushed stone base, laid by day labor. T. R. Stokes, Township Hall, Ferry St., clerk.

Oshawa, Ont.

Waterworks extensions contemplated by the town will include the purchase of 300 water meters and 20 hydrants. W. C. Smith, Town Hall, engineer.

Ottawa, Ont.

The City may decide to pave Central Terrace, from Lyon St. to the end of the Street. A. F. Mcallum, Commissioner of Works.

Port Colborne, Ont.

Sidewalks and Roads Commission has recommended to the Town Council that sidewalks be laid on Elgin St. from Elm to Fielden Ave.; Fielden Ave., from Kent to Ash; Alexandra, from Fielden to C.N.R. tracks; Sugarloaf St., from Isabel to Fielden Ave.; Port Colborne St., from Athol to the Town line.

Quebec, Que.

A road 150 miles long, from St. Anne des Monts to Perce, is proposed by the Provincial Government at a cost of $300,000. This work may be done this year but funds have not yet been voted.

The Provincial Government, Department of Mines and Fisheries, contemplate a road costing $200,000 passing through Mattawa, Ville Marie, Lake Opasatika and across the new mining region.

Regina, Sask.

The City will receive tenders for laying about 9,000 lineal feet of sewers and 2,026 lineal feet of 8 in. watermain, cast iron pipe, and 4,747 lineal feet of 6 in. watermain, cast iron pipe, until May 28. D. A. R. McCannell, engineer.

Renfrew, Ont.

Renfrew Town Council has decided that Bonnechere St. will be paved with macadam. Cement for the curbing and tar binder are the only materials which will be purchased. J. R. Stewart, engineer.

The City contemplates purchasing the following supplies for waterworks extensions: 6 in. pipe, class "B", 25½ tons; 4 in. pipe, class "B", 6½ tons; 4—6 in. gate valves; 3—4 in. gate valves; one ton of pig lead and three hydrants. J. R. Stewart, engineer.

Ste. Tite, Que.

Tenders will be called shortly by the Town Council for sewers costing $6,000. J. A. Mousette, clerk.

Sandwich, Ont.

The County of Essex, Sandwich, has extended the time for receiving tenders on two miles of concrete pavement, 18 ft. wide, until May 28. W. P. Coyle, Sandwich, clerk.

Essex County Council has also extended the time for receiving tenders for reinforced concrete pavement for the 1st Concession Road from Erie St. to Bevel line, and reinforced concrete pavement for Oak St. to 1st Concession Road, until May 28.

Tavistock, Ont.
Under the supervision of County Road Superintendent, Wm. Forbes, Woodstock, the Town Council proposes to lay a tarvia pavement about one mile long. In the Town the road will be 40 ft. wide and in the outskirts about 30 ft. wide. This work will be done by day labor. F. J. Ure & Sons, Woodstock, engineers.

Three Rivers, Que.
The Provincial Government contemplates a macadam road from Des Forges Rd. to the Country Club at a cost of $300,000. L. N. Perron, Quebec, Minister of Public Works.

Williamstown, Ont.
W. T. Bailey, Clerk of Charlottenburg Township, will receive tenders until May 30 for the following roadwork: 1—For furnishing and placing 800 cu. yds. of gravel on the 7th Concession road from McGillivray's side road westerly. 2—For furnishing and placing 800 cu. yds. of crushed stone on the 7th Concession road from McGillivray's side road westerly.

Windsor, Ont.
Gore, Nasmith & Storrie, Toronto, and J. Clark Keith, engineer for the Essex Border Utilities Commission, are preparing working plans for the filtration plant.

CONTRACTS AWARDED

Burlington, Ont.
McArthur Engineering Co. Ltd., Douglas St., Guelph, have been awarded the contract for concrete pavements for the Town at $2.10 per sq. yd.

Cobourg, Ont.
Warren Bituminous Paving Co. of Ontario, Ltd., Toronto, have the contract for pavements for William and George Sts., costing $69,544.

Edmonton, Alta.
The Crown Paving Co., Edmonton, have contracts for street paving for the city totalling $42,955.

Elora, Ont.
Town has awarded the contract for pavements costing $55,000 to W. C. Brennan, Melrose, Ave., Hamilton.

Halifax, N. S.
The following contracts for roadwork have been awarded by the Provincial Highways Board, Halifax: Goatlake bridge—Middle River bridge, 6.4 miles, Middle River bridge to Barkhouse Brook, 5.9 miles, Dibona & Orlando, Bridgetown; Barkhouse Brook to Mahone Bay, 6.0 miles, Robert Mitchell, Amherst; Truro—Valley Station, 3.87 miles, Fulton Bros.; Valley Station—Kemptown Bridge, 9.42 miles, Standard Construction Co. Ltd., Pickford & Black Wharf, Halifax; Kemptown Bridge to Lower Mount Thom, 7.67 miles, William Cooke, North Sydney; Carr's Brook to Five Islands, 5.4 miles, E. A. Cranton, Truro; Telford-Kenzieville, 8.88 miles, Mitchell Cameron, Sears & McIntosh, Antigonish; Shag Harbor Bridge to Barrington Passage, 5.75 miles, will be constructed by day labor under the supervision of the Highways Board.

Islington, Ont.
Etobicoke Township Council has awarded Angelo Cavotti, Wellington St. West, Toronto, the contract for laying 9,700 feet of watermains.

Leamington, Ont.
The Town Council has awarded the general contract for sewers on Erie St. south from Oak St. to the 1st Concession Road, to F. Smithson, Leamington.

Ottawa, Ont.
The City Engineer will pave Sunset Blvd. from Bronson St. to Driveway at a cost of $10,000.

O'Leary's Ltd., Bank National Bldg., will lay 4,700 sq. yds. of asphalt pavement and 3,600 ft. of curbs and gutters on Carlington Ave., between Fairmont and Parkdale Aves., for the city at a cost of $10,000.

Portage La Prairie, Man.
Fowler, Young & Holden Co. Ltd., 505 Winnipeg Electric Railway Chambers, have the general contract for watermains for the Provincial Government costing $10,800.

Quebec, Que.
Contract has been awarded by Minister of Highways, Province of Quebec, to Normand and Normand, L'Islet, for repairs to bituminous macadam on the Levis-Rimouski Highway at a cost of $21,965.30.

Contract has been awarded by the Highways Department, Province of Quebec to N. G. Scott, Scotstown, County of Compton, for the construction of gravel roads on the Beauceville-Sherbrooke route in the county of Compton; price $54,073.

Toronto, Ont.
Contracts Nos. 1 & 2 for concrete sidewalks for the Township of Scarboro have been awarded to E. J. Elliott, 269 Main St. East, Toronto. Contract No. 3 has been awarded to W. B. Hughes, 53 Victoria Park Ave., Toronto and is for concrete sidewalks also.

The Province of Ontario has awarded Somerville and Dillworth, Niagara Falls, contract No. 1002 which calls for bituminous penetration pavement from St. David's to Queenston, including grading 2.4 miles.

Warren Bituminous Paving Co., University Ave. and the Asphaltic Concrete Co., Excelsior Life Bldg., have been awarded contracts for bituminous paving by the City, totalling $111,490.

Contracts for asphalt pavements have been awarded by the City to Kilmer & Barber, 10 Adelaide St. East, and the Construction and Paving Co., Confederation Life Bldg. These contracts total about $91,000. The Commissioner of Works will lay asphalt pavements costing about $51,000.

Kilmer & Barber, 10 Adelaide St. East, and the Commissioner of Works have the contracts for laying asphalt brick block pavements for the city at a cost of $35,000.

Winnipeg, Man.
Granolithic sidewalks, costing $4,269, will be laid for the city by the City Engineer, 223 James St.

Railroads, Bridges and Wharves

Blissfield, N. B.
The general contract for a concrete arch bridge and roadway embankment at Molasses Hill, Northumberland County, has been awarded by the Provincial Government to Bruce L. Simmons, 621 Union St., Fredericton.

Bolton, Ont.
N. Harrison, will receive tenders for concrete bridges in Toronto and Gore Townships until June 1. Plans and specifications are at the reeve's office, Clareville, Ont.

Damascus, Ont.
W. W. Duncan, Clerk of West Luther Twp., will receive tenders for the construction of two 15 ft. span bridges on side roads 12 and 13 in Concessions 13 and 14, until May 26.

Hamilton, Ont.
Hamilton Street Railway proposes to lay new tracks on Main St. from Ottawa St. This project is estimated to cost $40,000. E. P. Coleman, Terminal Station, manager.

Kerwood, Ont.
Tenders for the construction of two concrete bridges costing $6,000 will be received by Ambrose Topping, Clerk of Adelaide Twp., until May 28.

Ottawa, Ont.
Tenders for the construction of the northerly 200 lineal feet of the slip wall at Whitby, Ont., will be received by R. C. Descochers, Department of Public Works, Ottawa, until May 30.

Pasbebiac, Que.
The Provincial Government will repair a bridge at Pasbebiac at a cost of $10,000. This work will be done by day labor under the supervision of the Department. M. Duford, engineer.

Quebec, Que.
Plans are being prepared by the Provincial Government for a steel bridge at Normandin, Que., and tenders will be called as soon as they are completed. I. E. Vallee, engineer, Parliament Bldgs., Que.

Regina, Sask.
H. S. Carpenter, Deputy Minister of Highways for the Provincial Government, will receive tenders until May 30 for a concrete bridge at North Gravelbourg, Sask.

The Provincial Government will also receive tenders on a 70 ft. suspended arch concrete bridge at Chamberlin, Sask., until May 30.

Tenders will be received by the Deputy Minister of Highways, H. S. Carpenter, until May 30, for a 60 ft. suspended arch concrete bridge north of Kinley, Sask.

St. Catharines, Ont.
Addressing representatives from various municipalities in the Niagara Peninsula, Sir Henry Thornton, head of the C. N. R., intimated that the Niagara, St. Catharines and Toronto Railway would be re-habilitated so as to adequately serve each municipality. New terminals,

[illegible] at Niagara Falls and St. Catharines, and where possible a private right-of-way might be secured to increase the rapidity of the service.

St. Marc, Que.
The Town Council contemplates the erection of a steel and concrete bridge. J. P. A. Menard, Beloeil, Que., secretary.

Toronto, Ont.
The Provincial Government will receive tenders for the construction of a bridge across the Humber River, on the Provincial Highway as follows: No. 983 For the steel superstructure, concrete sub-structure and flooring for the Humber River bridge in accordance with the Department's plans. No. 1011 For the superstructure and sub-structure of the Humber River bridge, alternative design. June 6 is the closing date for tenders.

Plans are being prepared for two reinforced concrete bridges for Scarboro Township. C. G. Fraser, 1362 Kingston Rd., engineer.

Welland, Ont.
The construction of a railway spur from Port Colborne to Welland, a distance of about eight miles, is being discussed by the M. C. R., T. H. & B. and the C. P. R. This road if built would be owned jointly by these railways.

CONTRACTS AWARDED

New Westminster, B. C.
Dominion Bridge Co., Winnipeg, Man., has been awarded the general contract for reinforcing steel work on the Fraser River Bridge by the British Columbia Provincial Government at approximately $25,000.

Public Buildings, Churches and Schools

Gore Bay, Ont.
A [illegible] school is contemplated by the Board, A. E. Graham, secretary. Proposed building will be two storeys high, containing six rooms. Architect not as yet appointed.

Haileybury, Ont.
St. Paul's Church, Haileybury, c/o Rev. F. H. Hinks, is receiving tenders for the erection of a brick church and separate tenders for a brick dwelling, until June 4.

Hamilton, Ont.
Rev. J. W. Englehert, 120 Sherman Ave., north, is receiving tenders for electrical work, plumbing, and heating for a church costing $100,000. No closing date for tenders has been set.

Landrienne, Que.
A chapel costing $15,000 may be built by the Roman Catholic Parish, Rev. A. Chapleau, curate. Building contemplated will be 45 ft. x 90 ft., with concrete foundations, frame and brick construction.

London, Ont.
Mayor G. A. Wenige will call for competitive plans for the City Hall about June 1. The building is estimated to cost about $300,000.

Trinity Luthern Church contemplates a building costing $10,000. Rev. M. Brener, minister. The architect has not yet been appointed.

Merritton, Ont.
A school costing $17,000 is contemplated by the Merritton School Board, R. Clarke, secretary. The architect has not yet been appointed.

Montreal, Que.
Cardinal & Beauchamp, architects, have called for tenders for a concrete, brick and frame school, 55 ft. x 65 ft., to be built at Mount Rolland, Que. The building will have one hall and will contain eight class rooms.

The Dominion Government, Department of Public Works, contemplates building a new Post Office here. An executive committee is conferring with the Post Master General with a view to having the building erected in the Maisonneuve district.

New Hamburg, Ont.
Tenders will be called about July 15 for a Post Office building for the town, costing $10,000. J. F. Ran, New Hamburg, Postmaster.

Port Colborne, Ont.
Rev. T. H. Cruise, 123 King St., will receive tenders until June 1 for the erection of a parish hall for St. Patrick's church.

Quebec, Que.
Tenders will be called shortly for the re-building of the Basilica. Tanguay & Chenevert, 20 D'Aiguillon St., architects.

Toronto, Ont.
The Separate School Board, 477 Jarvis St., Toronto, will receive tenders until June 4 for a school building containing 8 rooms. J. P. Hyney, 78 King St. West, architect, has plans and specifications.

Walker & Gibson, 70 Victoria St., Toronto, will prepare plans for an addition to a school at Long Branch in Etobicoke Twp., consisting of four rooms, brick construction.

J. Knox, 189 Rosethorn Ave., Toronto, will receive tenders for painting and glazing the addition to Silverthorn Public School, S.S. 35, York Township, until May 30.

Tenders for the following work will be received by the Board of Education until May 29. 1. Masonry, carpentry, structural steel, roofing, painting, asphalt mastic, plastering, fibre mastic flooring, plumbing, heating, heat regulation, ventilating, electric wiring, and local 'phones for Earl Haig School. 2. Electric wiring for the caretaker's cottage at Perth Ave. School. 3. Steel sash for Humberside Collegiate. 4. Asphalt mastic, linoleum for Bowmore Rd. School. 5. Ornamental iron for Wilkinson School. 6. Iron fencing for Grace St. School. 7. Painting and hardware for sundry schools.

The Board of Education will receive tenders for an exhaust ventilation system and an ash disposal system for Riverdale Technical School, until May 29.

Victoria, B. C.
Tenders for the erection of a hospital at Williams Lake, Cariboo District, will be received by the Minister of Public Works, Parliament Buildings, Victoria, until May 28. Plans and specifications may be seen at the Parliament Buildings.

CONTRACTS AWARDED

Birchcliffe, Ont.
Thomson Bros., Ryrie Bldg., have the general contract for a Sunday School for the Union Church which will cost about $25,000.

London, Ont.
R. G. Wilson & Son, 398 Talbot St., has been awarded the contract for an exhibition building at the Western Fair Grounds by the directors of that association. The building will be two storeys high, 185 ft. x 304 ft., steel and brick construction, and will cost about $150,000.

Montreal, Que.
Dussard, Jolly & Mongeon, 502 St. Catherine St., have the contract for tile flooring for the monastery being built by Dufresne & Paquette, 13 De L'Eglise St. for the Dominican Fathers.

W. S. D. Cook, 10 Cathcart St., has been awarded the general contract for a $200,000 edifice for Trinity Memorial Congregation. Ross & MacDonald, 1 Belmont St., architects.

New Waterford, N. S.
Plumbing and heating contracts for the new $70,000 hospital have been awarded to Matheson & Allop, North Sydney, by the Hospital Board.

Oshawa, Ont.
W. J. Trick Co. Ltd., 25 Albert St., Oshawa, have the general contract for the Public school at $139,733 and will let sub-contracts for plumbing, heating and wiring, when plans are completed.

Ottawa, Ont.
The Department of Indian Affairs has awarded the general contract for an Indian residential school near Edmonton to the Claydon Company of Winnipeg at $138,000.

Punichey, Sask.
School district No. 2257 has awarded A. Heise & Co., Saskatoon, the general contract for a school costing $20,130. Materials will be purchased and subtrades let by the general contractor.

St. John, N. B.
B. Mooney & Sons, Queen St., St. John, have the general contract for a memorial hall costing $15,000 for the Church of England Institute, Princess St.

St. Thomas, Ont.
Contracts awarded for the addition to the hospital are: masonry and carpentry, Ponsford Construction Co., 605 Talbot St.; electric wiring, Roberts and Sandham, 531 Talbot St., $3,900; plumbing, Hamilton and Stott, 430 Talbot St., $15,486; heating, C. E. Greenan and Co., 342 Ellis St., $18,151.

Toronto, Ont.
The Board of Education has awarded R. C. Dancy, 57 Kendal Ave., the con-

tract for plastering Humberside Collegiate addition, at $8,100.

Winnipeg, Man.
Winnipeg School Board has awarded the general contract for an addition to the school at Rathgar & Daly Sts. to Hazleton & Walkin Ltd., Winnipeg, at $31,000. Contracts for plumbing, heating and ventilation have been awarded to John Plaxton Co. Ltd., Winnipeg, at $8,489.

Business Buildings and Industrial Plants

Moncton, N. B.
Steeves & Tennant, Cable St., contemplate building a warehouse, corrugated iron construction, costing about $7,000.

Montreal, Que.
The Bell Telephone Co. of Canada, 118 Notre Dame St., has had plans drawn by W. J. Carmichael, staff architect, for a telephone exchange.

Quebec, Que.
Tenders will be called shortly for rebuilding "St. Roch" hotel, St. Joseph St. J. Oscar Gilbert, 99½ Lockwell St., Quebec, will receive the tenders.

St. Andrew's Que.
A paper mill with a capacity of five tons a day may be built here by the Western Quebec Paper Mill Ltd. C. De Wolf Reid, Room 300, 211 McGill St., Monereal is interested in the project.

St. John, N. B.
United Hotels Co. of America, Thomas, Armstrong & Bell, Market St., interested, contemplate an hotel costing $500,000. Ross & McDonald, 1 Belmont St., Montreal, architects.

Sarnia, Ont.
A press despatch from Sarnia states that private capital is planning to erect a grain elevator with a capacity of 1,500,000 bushels as a ship basin at the north end of Sarnia Bay. It is stated that this work will cost about $4,000,000.

Sussex, N. B.
The New Brunswick Telephone Co. Ltd., 22 Prince William St., St. John, is having sketch plans for an exchange prepared by F. Neil Brodie, architect, 42 Princess St.

Taber, Alta.
Ogilvie Flour Mills Ltd., Winnipeg, will build an elevator here to replace one recently destroyed by fire. Lumber for this structure has not yet been purchased.

Toronto, Ont.
About the end of May the Imperial Bank of Canada, Toronto, may call for tenders for a branch to be erected in the Danforth district. Mr. Burgess, 31 Colborne St., is manager of the premises department.

B. H. Prack, 50 Bay St., Toronto, has been appointed architect to prepare plans for an addition to the Canadian Westinghouse plant at Hamilton.

Tenders for all trades for a $20,000 garage for Geller Bros., 228 Spadina Ave., are being received by B. Brown, architect, 287 Spadina Ave.

Winnipeg. Man.
It is understood from newspaper reports that negotiations are in progress for the establishment of a large pulp and paper mill at St. Boniface, by Winnipeg interests. The project calls for a plant which will ultimately manufacture several hundred tons of paper a day with a plant and buildings costing several million dollars.

CONTRACTS AWARDED

Glace Bay, N. S.
The following contracts have been awarded by the Dominion Coal Co., for improvements to the colliery: Head frame and bank head, McKinnon Steel Co., Sherbrooke, Que.; transformer substation, Canadian General Electric Co., Montreal, $30,000; electric hoist, English Electric Co. of Canada Ltd., St. Catharines; $60,000 main pump, Sulzer Bros., London, Eng., $100,000 fan, Canadian Ingersoll Rand Co. Ltd., Montreal, $55,000.

Montreal, Que.
A. F. Byers & Co., 340 University St., will build a $10,000 addition to the Offices of the Hollond Varnish Co., 3000 Park Ave. Contracts for roofing and plumbing will be let by the general contractor.

Bathurst, N. B.
Geo. Eddy Co. Ltd., Bathurst, have the general contract for an hotel for Paul Doyle at Jacquet River, N. B. The general contractors have not yet secured the material necessary for this work.

Toronto, Ont.
Contracts awarded for the warehouse for Cassidy's Ltd., Montreal, which is being erected on Front St., Toronto, are: Excavating, Ontario Foundation & Engineering Co. Ltd., Toronto; metal sash, Metal Shingle and Siding Co., Montreal; electrical, Beattie-McIntyre, Ltd., Toronto; plumbing and heating, Mechanical Trades Co. Ltd., Toronto; cut stone, Hurst & Rogers, Toronto.

Witchall & Son, 156 St. Helen's Ave., will build a $10.000 service station for the Imperial Oil Co., 56 Church St.

Vancouver, B. C.
Vancouver Harbor Board has awarded the Pacific Construction Co. Ltd., 1212 Standard Bank Bldg., the general contract for a storage elevator costing $51,500. W. G. Swan, engineer for the Board.

Victoria, B. C.
Parfitt Bros.. Ltd., 1303 Galdstone Ave., Victoria, will build a garage costing $10,000 for W. R. Hall. Materials have not yet been purchased.

Residences

Brampton, Ont.
Waters and Wilkes, 43 Scott St., Toronto, are preparing plans for a $25,000 residence to be erected here.

Ford, Ont.
No materials have yet been purchased by Fred Renaud, 1601 Giles Blvd., for a duplex residence to be built on Pellette Road.

Hamilton, Ont.
Witton & Walsh, 17 Hughson St., Hamilton, will call for tenders shortly for a $10,000 residence for H. Slack, 116 Balmoral St. north.

Listowel, Ont.
Listowel Housing Commission Plans to build residences this summer costing $30,000. T. R. Kemp, mayor of Listowel, is interested in the project.

London, Ont.
Plans are being prepared by L. G. Bridgeman, Bank of Commerce Building for a residence costing $14,000.

Montreal, Que.
Roofing, electrical, plumbing, heating, plastering, brickwork, painting and millwork contracts for six pair of semi-detached residences costing $60,000 will be let by Owen Roberts, 340 Hingston Ave.

J. O. Nantel, 593 Old Orchard Ave., will let contracts for roofing, electrical work, plumbing and heating, for a residence costing $12,000.

E. Cournoyer, 295 Fourth Ave., Rosemount, will erect a three storey brick residence, 32 ft. x 45 ft.

O. Genest, 6482 Peloquin St. has foundations in for 9 flats costing $30,000. Sub-trades will be let.

Ottawa, Ont.
Walters and Wilkes, 43 Scott St., Toronto, are preparing plans for a $25,000 residence to be erected in Ottawa.

Cowie & Moore, 50 Craig St., Ottawa, are in the market for 18,000 brick and other materials for a dwelling costing $8,000.

St. John's Que.
A $12,000 residence is contemplated by Joseph Benoit, St. John's. Materials for the structure, which will be of brick, two storeys high, have not yet been secured. Sub-trades will be let.

Arsene Prairie, Richelieu St., will let contract for carpentry, roofing, electric wiring, plumbing, heating, plastering, etc., for three flats costing $10,000.

Stratford, Ont.
Contracts for electrical work, plumbing and heating for a residence costing $12,000 will be let. Jas Russell, Downie St., architect.

Toronto, Ont,
W. H. Hubbard, 231 Wright Ave., Toronto, will attend to all details and purchase all material for a dwelling costing $16,000. This house will be of brick, 2 storeys high.

Roofing, electrical, painting, plumbing and heating contracts for a $19,000 residence will be let by the general contractor, E. H. Yeigh, 43 Bloor St. East.

A. Wellwood, 316, St. Clair Ave., will build a $10,000 residence on Lauder Ave., near Miller Ave. Contracts for heating, painting, plumbing and plastering will be let.

Plans have been prepared for H. H. Malcomson, 84 Rushton Rd., for a residence and garage costing $15,000. Sub-trades have not yet been let and materials have not been secured .

Wm. H. Rutherford, 53 McLean Ave., is excavating for a two storey residence, 25 ft. x 36 ft., of brick and stone construction. Sub-trades for this structure, costing $12,000, have not yet been let.

Tenders are being received by W. H.

(Continued on page 51)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

County of Bruce

[illegible] received by the under- [illegible]

Monday the 18th day of June, 1923,

for the following works at the County Buildings, [illegible] County Council.

1. The Erection of addition to County Council Building.
2. The erection of Central Heating building and trenches for pipes.
3. The Installation of Central Heating Plant.

[illegible] may be seen and Forms of Tender obtained at the office of the undersigned on and after the 25th May, 1923.

FRED B. JAMES,
[illegible] Architect, Walkerton, Ont.

Tenders Wanted

Sealed tenders will be received by the undersigned at 352 8th Street West, Owen Sound, up to **May 31st**, for the construction of the following

Reinforced Concrete Bridges

Lot 2—Con. 3—Collingwood Township—12 x [illegible] 126 [illegible]

Lot [illegible] Con. 7—Artemesia Township—16 x 5—83 yards.

[illegible] 6—Osprey Township—14 x 10—117 yards.

Lot 36—Con. 6—Osprey Township—16 x 7½—102 yards.

Plans and specifications may be seen at the office of the Engineer in Owen Sound, or at W. L. Taylor's, SINGHAMPTON.

The lowest or any tender not necessarily accepted.

R. C. McKNIGHT,
County Engineer,
20-21 Grey County.

COUNTY OF WELLINGTON

Tenders For Concrete Bridges

Sealed tenders will be received by J. M. Young, County Road Supt., Court House, Guelph, up to noon on

Wednesday, May 30th, 1923,

for the construction of the following bridges.

100′ Concrete Truss Bridge with abutments on Queen St., Mt. Forest with an alternative tender for a steel truss and concrete floor 22′ wide.
20′ Concrete Culvert for above bridge.
40′ Concrete Truss for Augers Bridge on Road No. 30 about 5 miles from Elora.
24′ Concrete Truss also for Auger's Bridge.
40′ Concrete Truss for Creekbank Bridge 3 miles from Alma.
12′ Hagarty Bridge on Road 32 Peel.
12′ Jordan Bridge on Road 32 Peel.
14′ Schmidt Bridge.

Tenders will also be received for 3,000 cubic yards of grading at Auger's Bridges and for 10,000 cubic yards of grading at Mt. Forest Bridge.

For plans and specifications apply to Mr. Young or to the Engineers.

A. W. CONNOR & CO.
21 34 Victoria St., Toronto.

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

TENDERS for Concrete Pavement

Tenders will be received by the undersigned up to two o'clock P.M.

Monday, the 28th day of May, 1923,

for the construction of Re-inforced Concrete Pavement seven-eighths of a mile in length, to be laid in two twelve foot widths (centre strip in Street left open), with curbs on each side of Street, together with Catchbasins and Manholes. (In the current issue of the Contract Record is an advertisement for the County of Essex asking for Tenders closing the same day for Pavement in Mersea Township which is a continuation of this Pavement herein advertised). The Tender for Leamington Pavement to include a further section of re-inforced Concrete Pavement approximately 800 feet long by 22 feet in width with Curbs on both sides and with Manholes and Catchbasins.

Plans and Specifications to be seen at the Office of J. J. Newman, C.E., Davis Block, Windsor, and at the Office of the undersigned. Marked cheque for one thousand dollars must accompany tender.

No tender necessarily accepted.

Dated, Leamington, May 10, 1923.

R. M. SELKIRK,
20-21 Town Clerk, Leamington, Ont.

TOWNSHIP of ETOBICOKE

Tenders for Laying Watermains in Eastwood Park Area and O'Connor Subdivision

Sealed tenders properly marked and addressed to Mr. Barratt, Clerk, Islington, Ontario, will be received up to 12 o'clock noon,

Monday, June 4th, 1923,

for laying approximately seven miles of water mains between Long Branch Park and Etobicoke Creek in the Township of Etobicoke.

Plans and specifications may be seen at the Office of the Township Engineer, Islington, Ontario, or at the Office of the Consulting Engineers.

W. J. GARDHOUSE,
Reeve.

N. McNICOL,
Township Engineer.

STEPHEN BARRATT,
Township Clerk,
Islington, Ont.

JAMES PROCTOR & REDFERN, Limited,
Consulting Engineers,
36 Toronto Street,
21 TORONTO.

Tenders Wanted

ST. PATRICK'S PARISH HALL

Port Colborne, Ont.

Bulk and separate tenders for all trades required in the erection and completion of the above building will be received by Rev. Thomas Cruise, 123 King Street, Port Colborne, Ont., up until noon of

Friday, June 1st, 1923,

Plans and specifications with Rev. Thomas Cruise, Port Colborne. MacLean's Daily Reports, Toronto, and with the Architect.

No tenders necessarily accepted.

NORMAN A. KEARNS, Architect,
21 Welland, Ontario.

Tenders Wanted

BOARD OF EDUCATION

Sealed tenders addressed to the Business Administrator and Secretary-Treasurer, Board of Education, Administration Building, 155 College St., endorsed with the word "Tender" and also with the name of the school building and trade or article to which it relates, will be received until

Tuesday, May 29th, 1923,

for

(1) Masonry, Carpentry, Structural Steel, Roofing, Painting, Asphalt Mastic, Plastering, Fibre Mastic Flooring, Plumbing, Heating, Heat Regulation, Ventilating, Electric Wiring, Local Phones, for EARL HAIG SCHOOL.
(2) Electric Wiring for Caretaker's Cottage, PERTH AVE. SCHOOL.
(3) Steel Sash for HUMBERSIDE COLLEGIATE.
(4) Asphalt Mastic, Linoleum for BOWMORE ROAD SCHOOL.
(5) Ornamental Iron for WILKINSON SCHOOL.
(6) Iron Fencing for GRACE ST. SCHOOL
(7) Painting, Hardware for SUNDRY SCHOOLS.

Specifications and conditions of tendering may be seen and all information obtained at the office of the Architect of the Board, 155 College St., Telephone Trinity 8200.

Tenders must in the office of the Secretarial Department at the Administration Building, 155 College St., **not later than 4 p.m. on the day named**, after which no tender will be received.

The lowest or any tender will not necessarily be accepted.

W. W. PEARSE,
Business Administrator and Secretary-Treasurer.
F. E. POWELL,
Chairman Property Committee,
21

Tenders for School

Tenders will be received by the Separate School Board of Toronto for the erection of an 8 roomed school on Shaw St., Toronto.

Plans and specifications may be seen at the office of the architect, J. P. Hynes, 73 King St. West, Toronto, from May 21st to June 4th, 1923.

Tenders close at **5 P.M. June 4th, 1923**, at the office of the Board, 477 Jarvis St., Toronto.

The lowest or any tender not necessarily accepted.

(Signed) E. S. HENDERSON,
Business Agent for the Board.
May 15th, 1923 20-22

Tenders Wanted

Tenders will be received by the Municipal Council of West Luther Twp. at Damascus on

Saturday the 26th day of May,

at the hour of four o'clock p.m. for the construction of two 15 foot span bridges on Side Road 12 and 13 Cons. 13 and 14.

Plans and specifications may be seen at the Reeve's residence Lot 5½ 16, Con. 14 or at Damascus on day of letting contract.

Lowest or any tender not necessarily accepted.

W. W. DUNCAN,
20-21 Clerk.

TENDERS
for Concrete Pavement

Sealed tenders, marked "Tender for Pavement" and addressed to the undersigned, will be received until 1 P.M. on

Monday, the 28th May, 1923,

for about 2 miles of Re-inforced Concrete Pavement 18′ wide, on the Front Road, or First Concession, in the Township of Sandwich West. And about three-quarters of a mile of Re-inforced Concrete Pavement 18′ wide on the First Concession, in the Township of Mersea.

Plans, specifications, etc., can be seen at the office of the undersigned or at the office of J. J. Newman, C.E., Windsor, Ont.

All work let subject to the approval of the Dept. of Highways.

A marked cheque for $1,000.00 must accompany tender for each piece of work.

The lowest or any tender not necessarily accepted.

W. P. COYLE,
20-21 Clerk, Essex County, Sandwich, Ont.

COUNTY OF HALDIMAND

Tenders for Bridge

Sealed tenders, plainly marked as to contents, will be received up to 12 o'clock noon of

Wednesday, May 30th, 1923,

by Harrison Arrell, Esq., K.C., County Clerk, Caledonia, Ont., for the construction of a Concrete Truss Bridge, 60 ft. span with concrete abutments on Diltz Road over Oswego Creek, Lot 1, Con. II, Township of Moulton.

Plans and specifications may be seen at the office of the undersigned or at their branch office at Dunnville, E. Hinchliffe, Resident Engineer, or at the residence of Reeve John Martindale, Cayuga and Reeve Harry Huckner, Moulton.

The lowest or any tender will not necessarily be accepted.

FRANK BARBER AND ASSOCIATES LTD.,
County Engineers,
45 Jarvis Street,
21 Toronto.

County of Victoria, Ont.
and
Village of Bobcaygeon, Ont.
and
Village of Fenelon Falls, Ont.

Sealed tenders will be received by the undersigned at the Court House, Lindsay, up to noon,

Friday, June 1st, 1923,

for the construction of the following works:

COUNTY OF VICTORIA

Approx. 5000 sq. yds. of Base Course Macadam.

BOBCAYGEON

Approx. 10,300 sq. yds., of Bituminous Bound Macadam pavement on a base course macadam foundation.

Approx. 6,300 Lineal ft. of Concrete Edging.

Approx. 600 Lineal ft. of Curb and Gutter.

Approximately 900 cords of field stone have been purchased and piled in the vicinity of the works in Bobcaygeon for crushing and placing in the work by the Contractor.

FENELON FALLS

Approx. 3200 sq. yds. Bituminous Bound Macadam on a Base course macadam foundation

Approx. 3,200 Lineal ft. concrete Edging.

Approximately 250 cords of field stone have been purchased and piled in the vicinity of the work in Fenelon Falls for crushing and placing in the works by the Contractor.

Specifications and forms of tender will be given out at the office of the undersigned.

Tenders must be accompanied by a marked cheque equal to 5% of the value of the contract.

The lowest or any tender not necessarily accepted.

E. L. MILES,
County Road Superintendent,
Lindsay, Ont.
May 17th, 1923. 21

Notice to Contractors

Separate sealed tenders, marked "Tenders for Contract No. ......", will be received by the undersigned until twelve o'clock noon on

Wednesday, June 6th, 1923,

for the work of building a bridge over the Humber River at Bloor Street on the Provincial Highway in the Township of Etobicoke. Contractors may submit alternative designs in reinforced concrete.

Contract No. 983—For the steel superstructure, concrete substructure and flooring of the Humber River bridge, in accordance with the Department's plans.

Contract No. 1011—For the substructure and superstructure of the Humber River bridge, alternative design.

Plans, specifications, information to bidders, tender forms, and tender envelopes may be obtained on and after Tuesday, May 22nd., 1923, at the office of the undersigned, or from D. H. Philp, Resident Engineer, Highway Administration Building, Toronto.

A marked cheque for $5000.00 payable to the Minister of Public Works and Highways, Ontario, or a Guaranty Company's bid bond for a similar amount must be attached to one tender. A Guaranty Company's contract bond for 50% of the amount of the tender will be furnished by contractor when contract is signed. All bonds must be made out on Departmental forms.

The lowest or any tender not necessarily accepted.

W. A. McLEAN,
Deputy Minister of Highways.
Department of Public Highways, Ontario,
Toronto, May 15th, 1923 21

QUANTITY SURVEYOR—Fully qualified in all classes of work wants position. Box 246, Contract Record, Toronto. 18-21

Tenders for Teaming

Tenders close Saturday, May 26th, unloading and teaming 5,000 cubic yards gravel and sand, 6,000 barrels of cement at Burlington.

THE GRANT CONTRACTING CO. LTD.,
47 Wellington Street East,
21 Toronto.

City of Montreal

TRUCKS

Sealed tenders, addressed to the Executive Committee and transmitted by registered letter, for the supply and delivery of

Ten Five-Ton Trucks

will be received at the City Hall, provided that such tenders be mailed not later than **May 30th, 1923**, to be opened June 1st, at noon.

Forms of tenders and specifications may be obtained at the office of L. O. PION, Superintendent of Purchases and Sales, 352 DeFleurimont Street, and all information required will be given by H. A. TERREAULT, Director of Public Works, City Hall.

RENE BAUSET,
City Clerk.
City Clerk's Office, City Hall,
Montreal, May 21st, 1923. 21

Tenders Wanted

BOARD OF EDUCATION

Sealed tenders addressed to the Business Administrator and Secretary-Treasurer, Board of Education, Administration Building, 155 College St., endorsed with the word "Tender" and also with the name of the school building and trade or article to which it relates, will be received until

Tuesday, May 29th, 1923,

for

(1) **Linoleum.**
(2) **Timeclocks.**
(3) **Exhaust Ventilation.**
(4) **Ash Disposal System.**

for RIVERDALE TECHNICAL SCHOOL

Specifications and conditions of tendering may be seen and all information obtained at the office of the Architect of the Board, 155 College St., Telephone Trinity 8200.

Tenders must in the office of the Secretarial Department at the Administration Building, 155 College St., **not later than 4 p.m. on the day named,** after which no tender will be received.

The lowest or any tender will not necessarily be accepted.

H. L. KERR,
Chairman Advisory Industrial Committee.
W. W. PEARSE,
Business Administrator and Secretary-Treasurer.
21

REINFORCED CONCRETE GENERAL SUPERINTENDENT wants position on Buildings, Bridges or Elevators, can produce best results. Box 276, Contract Record, 21-24

Tenders Wanted

[illegible] Building, [illegible]

Thursday, June 7th, 1923,

[illegible] Esq., [illegible] Dr. Logie, [illegible]

[illegible] Clerk's Office, Paris, and at the architect's, F. C. Bodley, Temple [illegible]. A marked cheque for 5% of [illegible]

The lowest or any tender not necessarily accepted.

F. C. BODLEY, Architect,
Temple Building,
21 Brantford, Ont.

City of Peterborough

Sealed tenders, plainly marked on the envelope, "Tender for Pavement" and addressed to "City Clerk, City Buildings, Simcoe Street, Peterbor[illegible] will [illegible] up to 5 p.m.

Thursday, May 31st, 1923,

for the construction of Concrete or Asphalt Pavements on George Street from the Canadian Pacific Railway to Romaine Street and on Hunter Street from Burnham Street to a point 350 feet East of Armour Road.

Specifications and plans may be seen and Forms of Tender secured at the Office of the City Engineer, City Buildings, Simcoe Street.

The lowest or any tender will not necessarily be accepted.

R. H. PARSONS,
City Engineer.

Peterborough, Ontario,
May [illegible], 1923 21

WANTED

To rent Keystone Excavator for cutting down grade on hill: about 6000 cubic yards. A. K. Hay, 279, Carling Ave., Ottawa. 21

To Rent

Steam Road Roller, First Class Shape. The T. Sidney Kirby Co. Limited, 213 Sussex St., Ottawa. 16-T.f.

STEEL PILING

Bought and Sold

Universal Equipment Company

Niagara Falls. 11-T-f.

Steam Shovel for Sale

70 Ton BUCYRUS Steam Shovel second hand, in good working order, located Winnipeg. Reasonable Price. For full particulars wire or [illegible]

POWELL EQUIPMENT COMPANY LTD.,
403 McArthur Building,
21-22 Winnipeg, Man.

Concrete Mixer for Sale

One Concrete Mixer, ½ yard capacity, loading [illegible] made by London Concrete Machinery Company. Good condition, $900.00 Price new over $2,200.00.

THE LABERGE LUMBER CO. LTD.,
19-21 Sudbury, Ont.

WANTED

To buy a Steam Roller immediately. Box 275, Contract Record, Toronto. 21

WANTED

Exclusive representatives resident in Toronto; Hamilton; Windsor; Fort William; Sudbury; Halifax; Sydney; St John, N.B.; Quebec; Three Rivers, for well-known Waterproofing System. Must have connection with Architects, Engineers, Contractors, Pulp and Paper and Industrial plants and show good record. To such a very attractive contract will be given. Box 254, Contract Record, Toronto. 21

FOR SALE

All Steel Revolving Guy Derrick

Capacity—10 Tons.
Mast 90 ft. High. Boom 80 ft. Long.
Both in Sections about 30 ft.
Complete with Bull Wheel, Sheaves, Pins, etc.
No Cable or Guy Ropes.

PRICE: $850.00 f.o.b. cars, New Glasgow, N.S.

This Derrick was built for our own Erection Department and is First Class in Every Particular.

THE MARITIME BRIDGE CO LTD.,
21 New Glasgow, N.S.

For Sale

New and Second Hand Rock Crushers, Steam and Gasoline Rollers, Portable Steam Engines, Dump Wagons, Etc.

Also

Repairs for Crushers, etc.

J. B. DORE & FILS,
18-21 Laprairie, P. Que.

Some One Wants to Buy

The equipment or machinery that you are not using.

It may be occupying valuable space in your yard or shop, collecting dust, rust and hard knocks.

Sell it before "Depreciation" scraps it.

Use the Tender & For Sale Department. It helps others, let it help you.

CONTRACTOR'S SUPERINTENDENT, just disengaged, requires position, life-long experience, well up in all classes construction, quantities and estimating, excellent references. Box 224, Contract Record, Toronto. 21

WANTED position as foreman or superintendent on construction work, on sewers, tunnels, watermains, pavements, sidewalks, macadam roads. A1. I have recommendation if needed. All kinds of construction work. Box 193, Walkerville P.O., Ontario. 18-21

ESTIMATOR—Open for engagement; Scotch trained; twenty years experience. Box 245 Contract Record, Toronto. 18-21

SUPERINTENDENT of construction completing half a million job open for position by 1st of June. Best references. Go anywhere. Box 253, Contract Record, Toronto. 19-21

WANTED—A foreman to take charge of water bound macadam job. State experience, references and wages expected. Box 274, Contract Record, Toronto. 21

POSITION WANTED by first class draughtsman and estimator on sheet metal and cornerswork. Practical and selling experience. Box 269, Contract Record, Toronto. 21-22

New Gulf Wireless Station

Announcement has been made that a Government wireless station is to be erected on St. Paul's Island, which stands in the entrance to the Gulf of St. Lawrence, on the most northeasterly point in Nova Scotia. Two wireless engineers have been landed by C. G. S. Montcalm at St. Paul's Island to arrange for the erection of the station.

St. Paul's Island is at present connected with the mainland by a telegraph cable which has not only been expensive to maintain, but is frequently interrupted by breaking.

High Tower for London

London may soon have an "Eiffel tower" built of concrete, 600 feet high. It will be erected at Wembley, the seat of the British Empire exhibition. Although falling short the height of the Eiffel tower in Paris, the proposed structure will give visitors to the exhibition a panoramic view of the country for hundreds of square miles.

The tower will be three times as high as the Nelson column in Trafalgar square, and will be surmounted by a searchlight so powerful that it can be seen from the coast of France.

Visitors will be taken up to the tower in a giant cage, which will rotate around the exterior at the rate of 14 miles an hour. Engineers predict that from the top they will be able to see the lights of Birmingham, 115 miles from London.

Tired of Skyscrapers

Skyscrapers, source of pride of most New Yorkers in particular and citizens of the United States in general, do not find much favor with Egerton Swartout, prominent New York architect and well-known writer on architectural subjects.

'We are rather fed up with skyscrapers down in New York," he told the members of the Province of Quebec Association of Architects at a dinner given by that body in the Ritz-Carlton Hotel recently. "They are certainly not handsome," he declared, "and while a system of rationality is now being introduced, they are a pretty bad thing on the whole."

Mr. Swartout praised the limitation policies of such cities as London and Montreal, stating that the skyscraper question has become very acute in New York, the main difficulty being the traffic congestion problem. Thousands of people who leave the skyscrapers at the same time during the rush hour literally block up the thoroughfares, all within a very small area of the city.

Residences

(Continued from page 47)

Little, Mimico Beach for electrical work, plumbing, heating and plastering for a $12,000 residence. Builder has not yet secured lumber, plumbing, roofing, flooring or furnace.

Verdun, Que.

Sub-trades for eighteen flats, costing $45,000, will be let by the builder, L. L. Barre, 330 Regina Ave. Materials for this building have not yet been purchased.

Nine flats costing $15,000, 3 storeys, 50 ft. x 50 ft., are contemplated by O. Barre, Evelyn and Hickson Sts. Materials have not yet been purchased.

O. Perrier, 1215 Evelyn St., contemplates three flats, 3 storeys, 50 ft .x 50 ft., costing $14,000. Materials for this work have not yet been purchased.

Waterloo, Ont.

St. Savoir's Church contemplates a rectory costing $10,000. Rev C. W. Foreman, Allen St., interested.

Westmount, Que.

H. Mills, 1196 Cote St. Antoine Rd., has the foundations in for a dwelling costing $25,000 and will let contracts for roofing, electrical work, plumbing, heating and millwork.

John Allan, 300 Atwater Ave., who has the general contract for a $35,000 residence will buy all materials and will probably let the sub-trades.

C. J. Brown Ltd., 4363 St. Catherine St., west, will build three residences costing $72,000. Materials have not yet been purchased and sub-trades will be let.

Winnipeg, Man.

Geo. Sparrow, 22 Arlington St., is building a residence costing $12,500, two storeys high, brick and concrete construction.

CONTRACTS AWARDED

Point Grey, B. C.

Curr & Hallert, 2166 Cambridge St., Vancouver, are building a $15,000 concrete, stone and brick residence for H. J. Davis, Lee Bldg., Vancouver.

Robert McCoubrey, 4024 Gladstone Rd., Vancouver, will build a residence for W. A. Denby, 168 Pender St. west, Vancouver at a cost of $16,500.

Preston, Ont.

Jas Eagle has the general contract for a $30,000 residence for F. H. Patterson. J. H. Mickler, 459 Duke St., architect.

Power Plants Electricity and Telephones

Dundas, Ont.

The Public Utilities Commission contemplates an extension to the Hydro-electric Sub-station costing $4,500. Wm. Mount, chairman.

Paisley, Ont.

The Ontario Hydro-electric Commission, University Ave., Toronto, will commence work this month on a transmission line from Chesley to Paisley in connection with the development of the Paisley electric plant costing $50,000.

St. John, N. B.

New Brunswick Electric Power Commission contemplates a transmission line from the Maine—New Brunswick border to Woodstock, a distance of about 45 miles, serving, Bath, Bristol, Florenceville and Hartland. C. O. Foss, St. John, engineer.

CONTRACTS AWARDED

Cobalt, Ont.

The contract for the power house for the first unit of 20,000 horse-power, for the Northern Canada Power Company, on the Des Quinze River, has been awarded to Morrow & Beatty, Peterboro', Ont.

Fort William, Ont.

Mahon Electric Co., Fort William, has been awarded the electrical contracts by Carter, Halls & Aldinger for the installation of electrical equipment in the Bawlf and Stewart elevators. This company also has contracts for wiring and equipment for elevators for the Barrett-McQueen Co. and the Feagles Construction Co.

Miscellaneous

Halifax, N. S.

Standard Construction Co., Pickford & Black Wharf, Halifax, are interested in prices on several cars of spruce or hemlock logs in 50 ft. lengths to 65 ft. lengths and also 5 cars of timber, 10 in. x 10 in., 10 in. x 12 in., 12 in. x 12 in., in lengths of 16 ft. and up.

Hamilton, Ont.

Sealed tenders for one horizontal centrifugal sewage pump (capacity 130 G.P M., at 67 ft. head), with 10 h.p. motor and automatic starter will be received by the City of Hamilton until June 6. S. H. Kent, City Clerk.

Levis, Que.

Tenders for steel tanks, costing $50,000 will be called by the city shortly.

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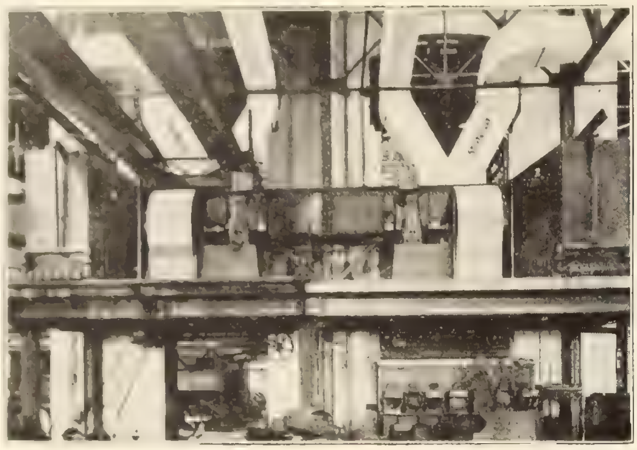

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Sturtevant engineers will show you the definite economies of these installations. Ask their help.

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of Canada, Limited.
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Sturtevant
PUTS AIR TO WORK

Late News

Chatham, Ont.

The City and the C.W. & L.E. Railway have reached an agreement regarding the paving of Queen St., south, and it is understood that this work will be proceeded with at once.

Fredericton, N. B.

Tenders for the following roadwork will be received by the Provincial Government, P. J. Venoit, Minister of Public works, until May 30: No. 39—Norton to Bloomfield, 5 miles; 40—Renous to Derby, 10 miles; 41—Victoria County line, north 5 miles; 42—Boiestown, north, about $30,000 has been allotted for this work.

Guelph, Ont.

A Normal School at Guelph is contemplated by the Provincial Government. H. F. McNaughton, Parliament Buildings, Toronto, secretary.

Islington, Ont.

The Etobicoke Township Council has authorized an extension to the water area at an approximate cost of $100,000.

Montreal, Que.

Tenders for an extension to elevator "B" will be received by the general manager of the Harbor Board, M. P. Fennell, Jr. until May 29.

Niagara Falls, Ont.

Mayor C. R. Newman has announced that he has received definite assurance that reconstruction on the N. S & T. Railway will commence within three weeks, and that Manager T. O. Scott, Toronto intimated that an order for $30,000 worth of steel will be placed this week.

Renfrew, Ont.

Mills and warehouse of the Renfrew Flour Mills Co. were destroyed by fire entailing a loss of $225,000. Hon. Thos. Lowe, Minister without portfolio, in the Dominion cabinet is president of the company. The loss, it is stated, is covered by insurance.

Thornbury, Ont.

Ratepayers have passed a by-law authorizinz the council to issue debentures to the amount of 18,000. This sum will be used to install and equip a waterworks system. The by-law provided for the construction of apump-house, filter water tank and pumping machinery.

Toronto, Ont.

Tenders for sub-trades for the addition to Earl Haig school will be received by the Board of Education until May 29. W. W. Pearse, 155 College St., secretary.

It has been reported that the Dominion Construction Co., Toronto, has been awarded the contract for the bulk of the construction work in connection with the Michigan Central Railway yards at St. Thomas. An estimate places the cost of this work at $500,000

Springhill, N.S.

Tenders for a moving picture theatre, estimated to cost $25,000 will be called shortly. F. Neil Brodie, Princess St., St. John, N. B. architect

Tenders will be called within two weeks for a school containing six class rooms. The building will be of red brick construction with stone steps and window sills. J. L. Allen, Amherst, architect.

BURLINGTON STEEL COMPANY, LIMITED

HAMILTON CANADA

Steel ingot which has been cut in half, showing the "pipe" in the centre and the porous segregated portion at the top. In the manufacture of rail steel the ingot is carefully cropped to remove all pipe and segregation, thus insuring a steel of the highest quality.

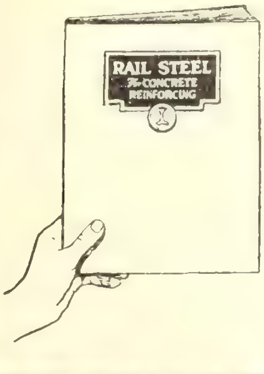
Quality and Metal Fatigue

The quality of steel is determined by the care used in its manufacture. Railroad rails, being subjected to enormous stress, both static and dynamic, are manufactured from steel made under the most careful methods. The tapping of the steel from the furnaces, the pouring of the ingots, the temperatures in the soaking pits, the rolling of the ingot to the bloom, the crop to eliminate the pipe and segregation, and the rolling of the rail, are all carefully followed by railway as well as mill inspectors. Particular attention is paid to the elimination of all piped and segregated material, so very important to the production of a pure and uniform product. It is from rails manufactured in this way that Rail Steel Reinforcing Bars are rolled. The bars retain all of the quality, all of the purity, and all of the strength of the original rail. Rail Steel Bars are made from a steel originally manufactured for a definite purpose, and this purpose demands the best steel possible to produce.

The impression sometimes gained is that the strain set up in the rails, due to their strenuous service on the railroads, is somehow or other carried into the bars produced from them and that the structure of the bar is thus impaired. This is not true. The heating of the rail for rolling removes every strain and the steel in the rail, as it enters the rolls of the bar mill, is in eactly the same condition as it was prior to its years of service.

RAIL STEEL BARS rolled from railroad rails have provided a concrete reinforcement of quality—quality obtained through care in manufacture—a degree of quality possessed by no other reinforcement steel.

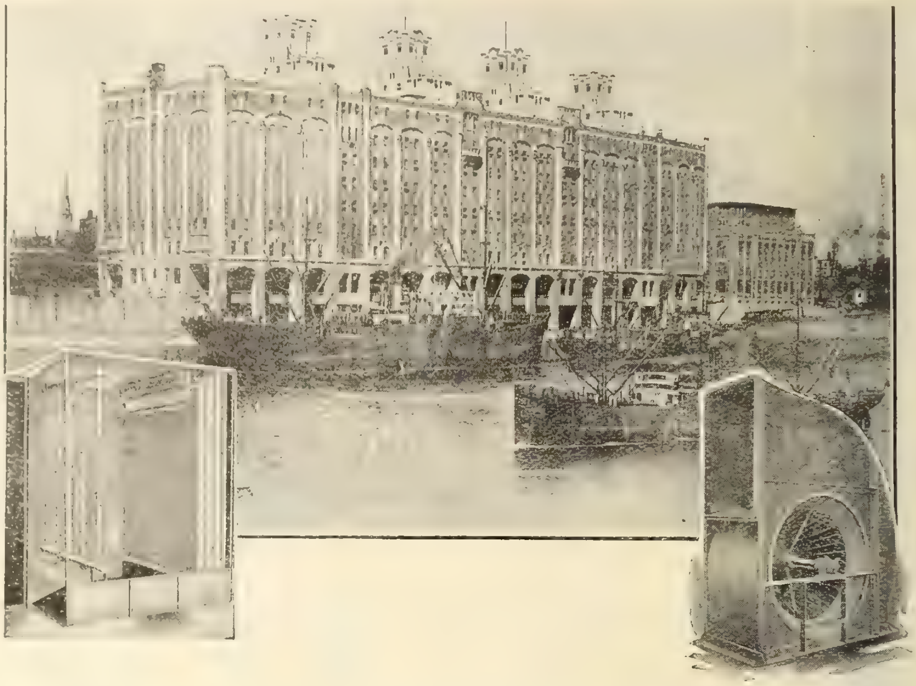
Specify your reinforcing steel to meet A.S.T.M. specifications A-16-14.



Send for This Valuable Booklet—FREE

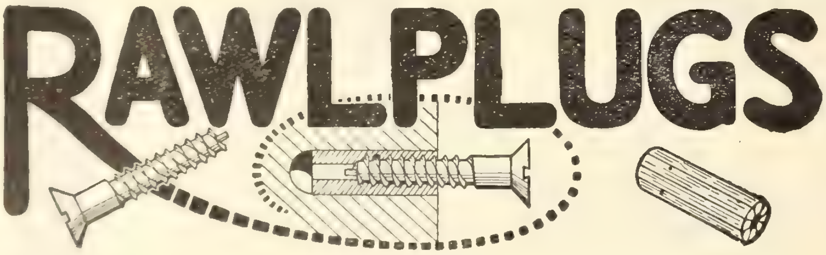
The first and only authoritative and comprehensive treatise on concrete Reinforcing Bars and containing most important information on the manufacture, qualities, and use of Rail Steel Bars.

Largest
Cold Storage
Warehouse
in America has
Air and Brine
Circulated by
Our Fans, Pumps
and Carrier
Air Washers



Fumes from material that previously occupied storage space are kept from contaminating next material stowed. Send for catalog covering equipment. Write to Department No. 12.

Canadian Blower & Forge Company, Ltd. **Kitchener, Ont.**
Toronto Montreal Calgary Vancouver St. John Winnipeg



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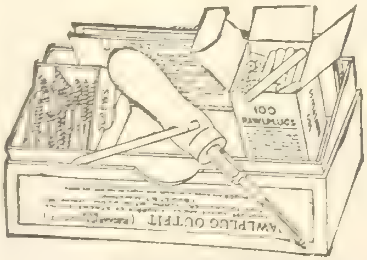

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Agents wanted in Ottawa and Vancouver

Here's Real News

The Hydro Electric Power Commissioners of Ontario
have appointed a Sales Syndicate
to advantageously liquidate all the

Equipment and Supplies

which can be released from the

Queenston-Chippawa Development

The majority of this Equipment—recently released—was purchased new and used only on the above undertaking. This is a splendid opportunity to secure really high grade, modern Machinery-Accessories and Supplies at prices that are right.

Our amended Stock List is now being prepared and we will be very glad to forward your copy, upon request. Time spent consulting this list will be time well spent. Someone will profit handsomely as those who purchase any of this "special offering" which is available are going to make one of the best purchases in their career.

We give below a general idea of what class of equipment is available.

Steam and Electric Shovels—Steam and Electric Locomotives—Air Dump Cars—Air Compressors—Channellers—Conveyors—Drills—Motors—Concrete Mixers—Concrete Cars and Auxiliary Equipment—Electric and Steam Hoists. In fact—almost everything you might require.

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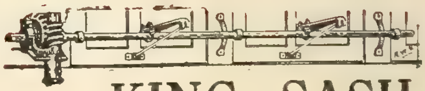

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Current Prices of Building and Engineering Materials

		Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.35
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	14.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.80**	11.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	30.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*†	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	30.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	70.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up to	230.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		50.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	80.00
Fire clay	per ton	13-20	15-16.00	35.00**	22.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.00 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 "	" "
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.		3.75 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	3.90 base	3.75 "	5.10 base	
Hoops	per 100 lbs.	4.40 "	4.75 "		
Twisted and deformed bars	per 100 lbs.	5.00 "	3.75 "	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	3.90 "	3.75 "	5.35	6.00
Structural shapes	per 100 lbs.	4.00 "	4.00 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.90 "	3.75 "	5.15	6.25
Plates—3/16 in.	per 100 lbs.	3.75 "	4.10 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.40 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	4.50 "	5.10 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	5.50 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	6.65 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
Cast iron pipe	per ton	65.00 "	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.28
Sewer pipe, 6 in	per ft.	.60	.45	.45	.48
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.55
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.70
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.85
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.80.
BRICK AND TILE—*f.o.b. plant.
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Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	94.50	55.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	30.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	171.00	200.00
Flooring, plain red oak, ⅛ in. clear	per M.	130.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	30.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	per M.	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	42/48	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	11.00-13.50
Spruce, 1 and 2 x 4 to 12 in.	per M.	50/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.50	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	15.00	14.60	15.60	15.80
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	22.00
Putty in bulk	per cwt.	5.95	4.25	5.50	9.25
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.48	1.40	1.26	1.28
Raw linseed oil, in bbls.	per gal.	1.45	1.38	1.23	1.25
Turpentine, in bbls.	per gal.	2.20	2.20	2.50	1.60
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	30.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.25	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers (Common)	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Laborers (Skilled)	per hr.	.60- 70			.90
Sheet Metal Workers	per hr.	.80			

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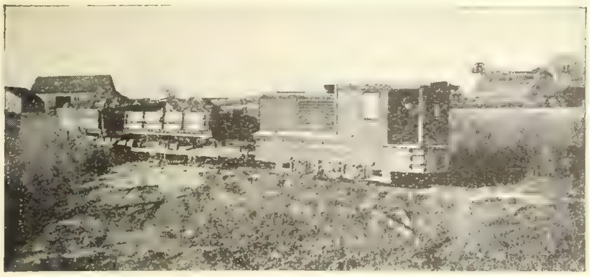

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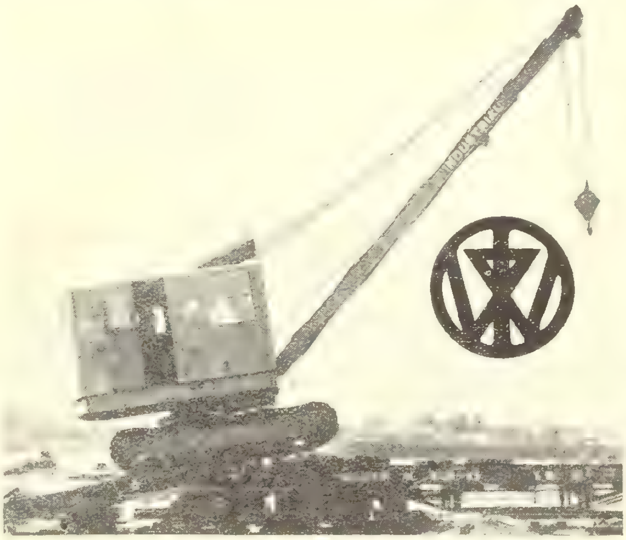

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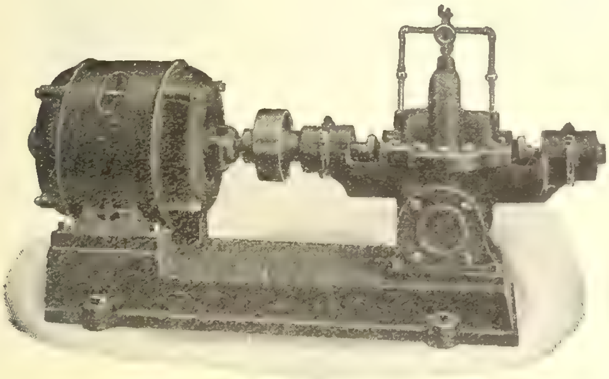

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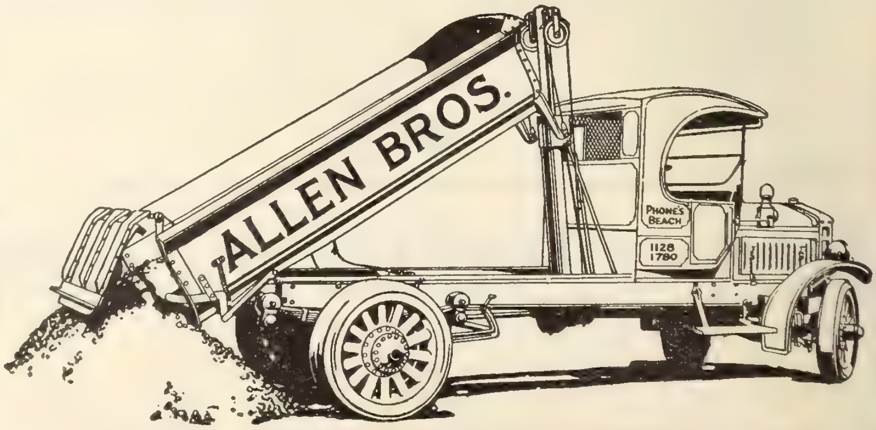

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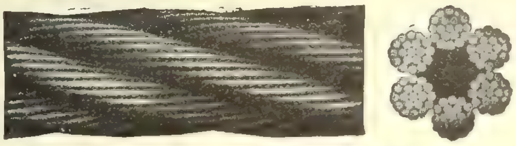

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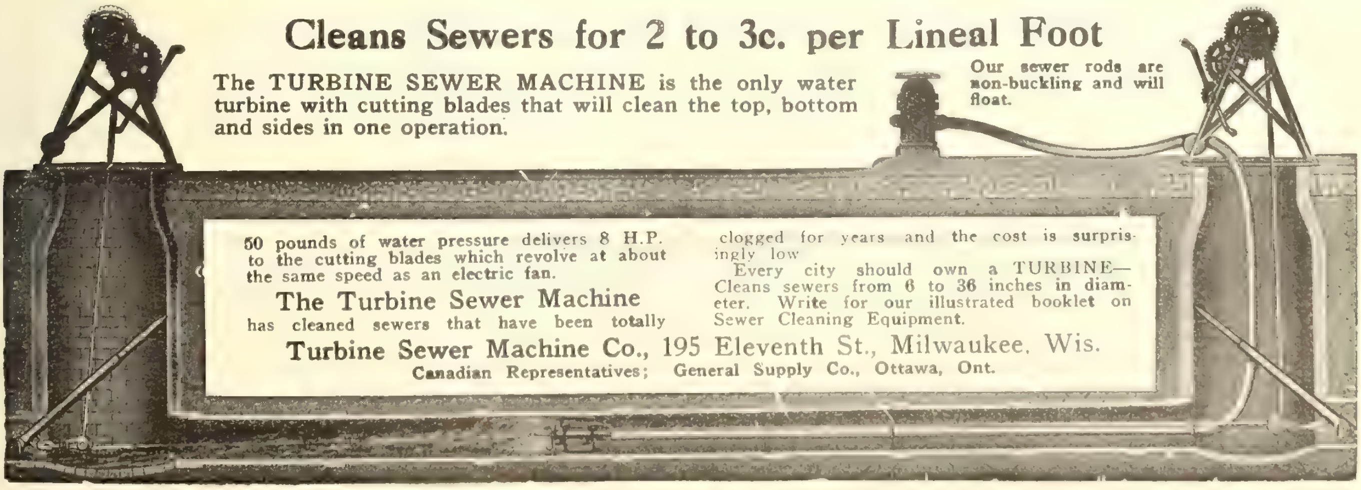

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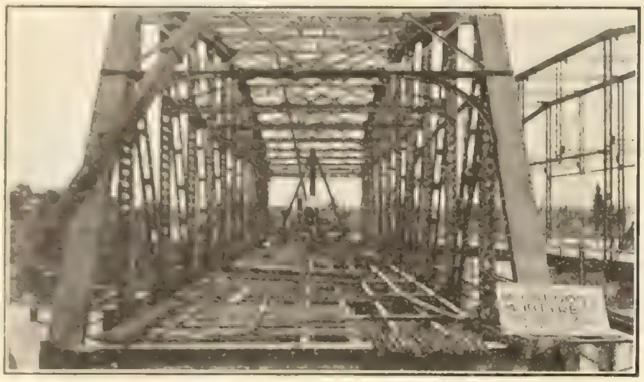

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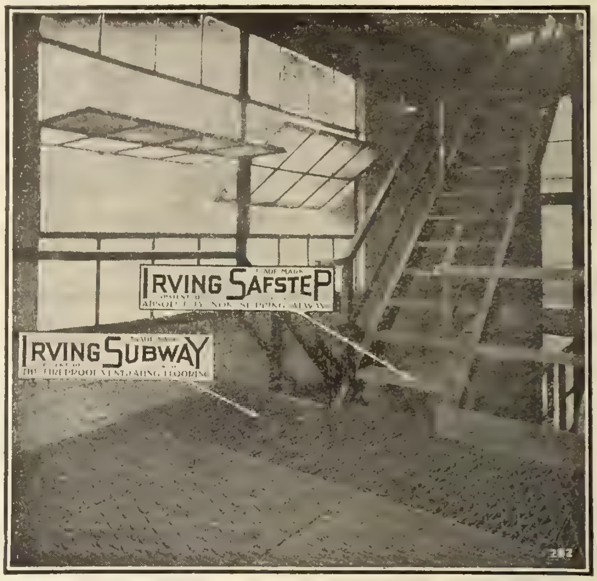

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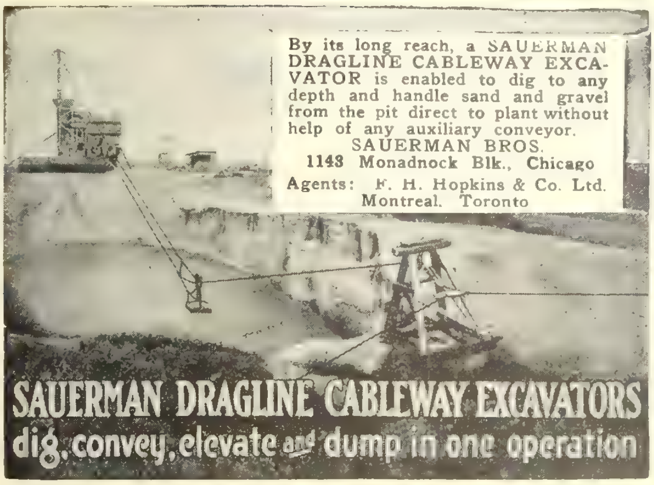

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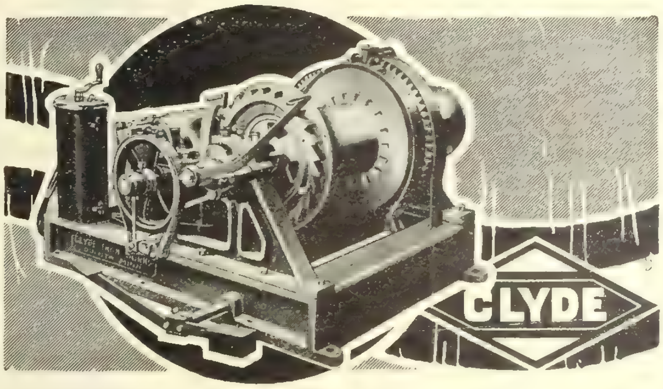

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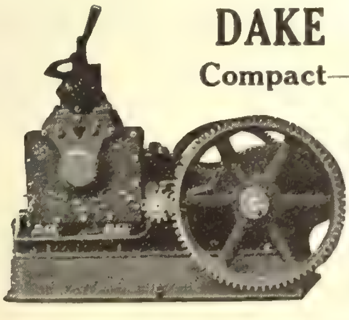

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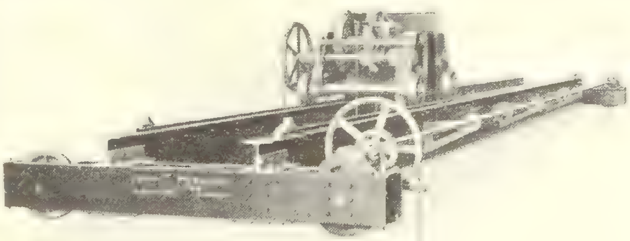

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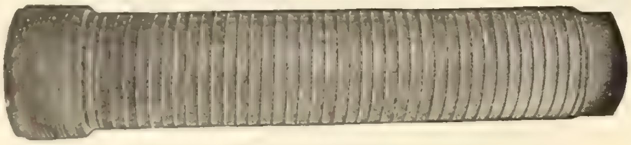

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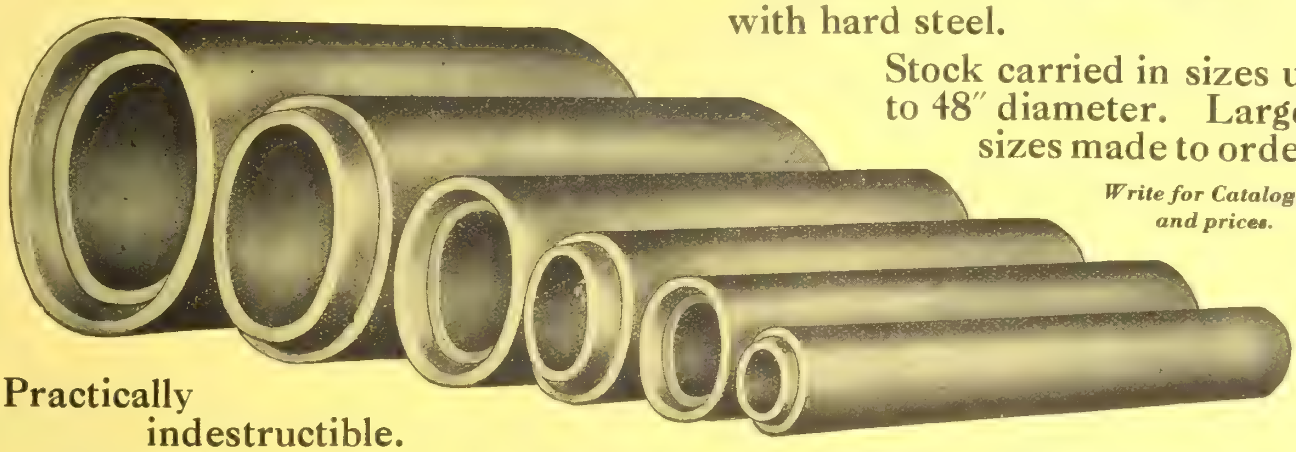

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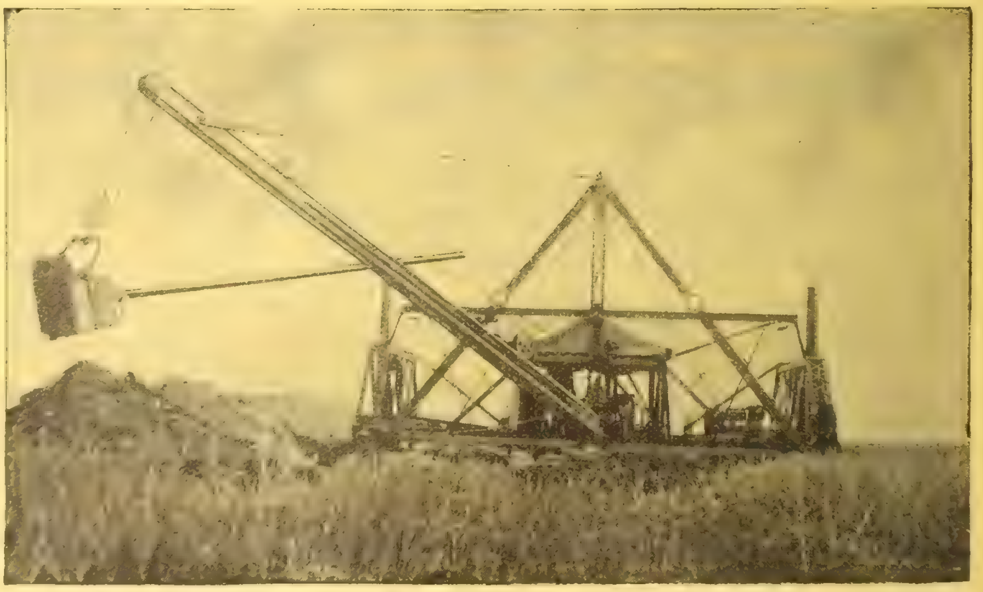

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Contract Record and Engineering Review

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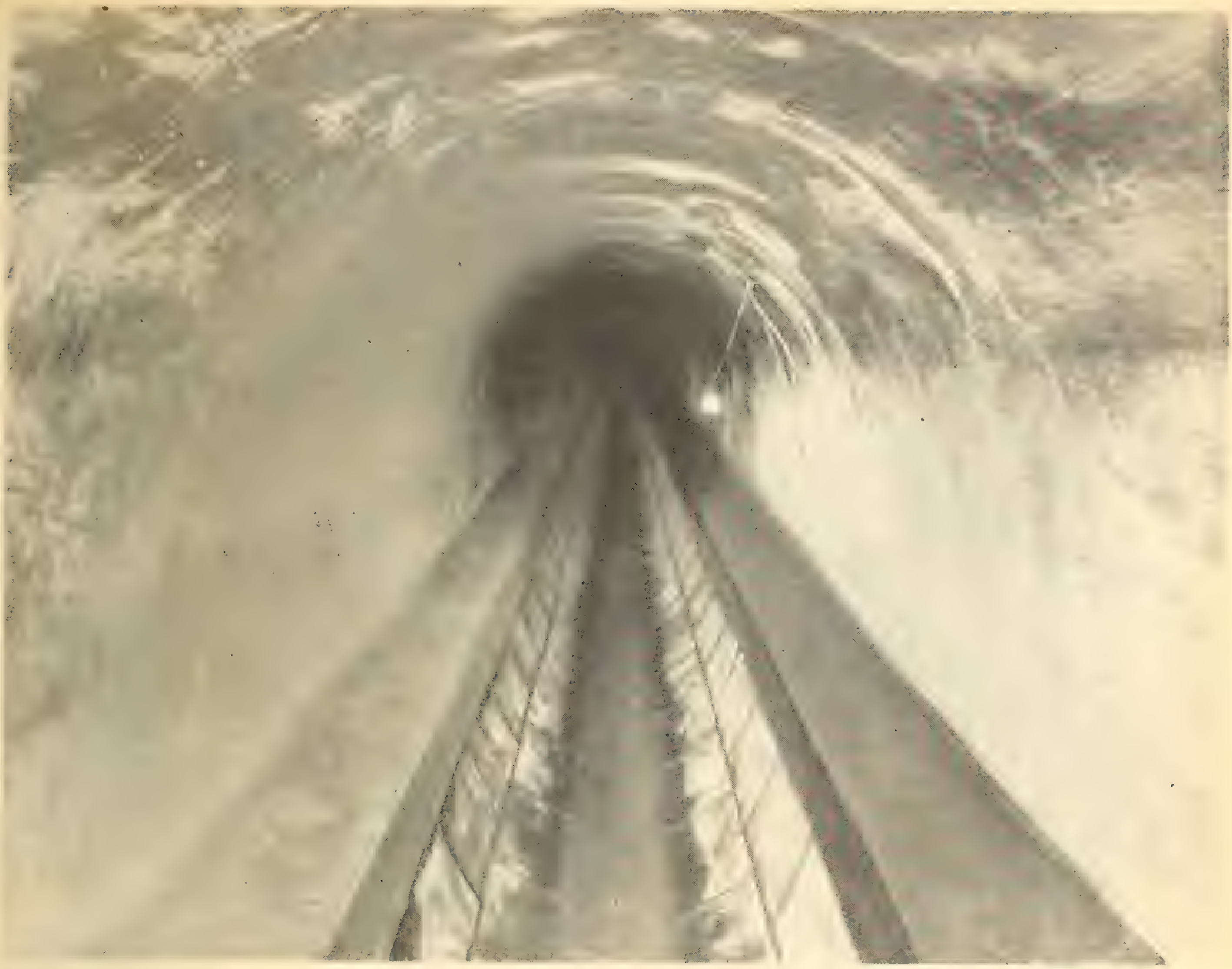

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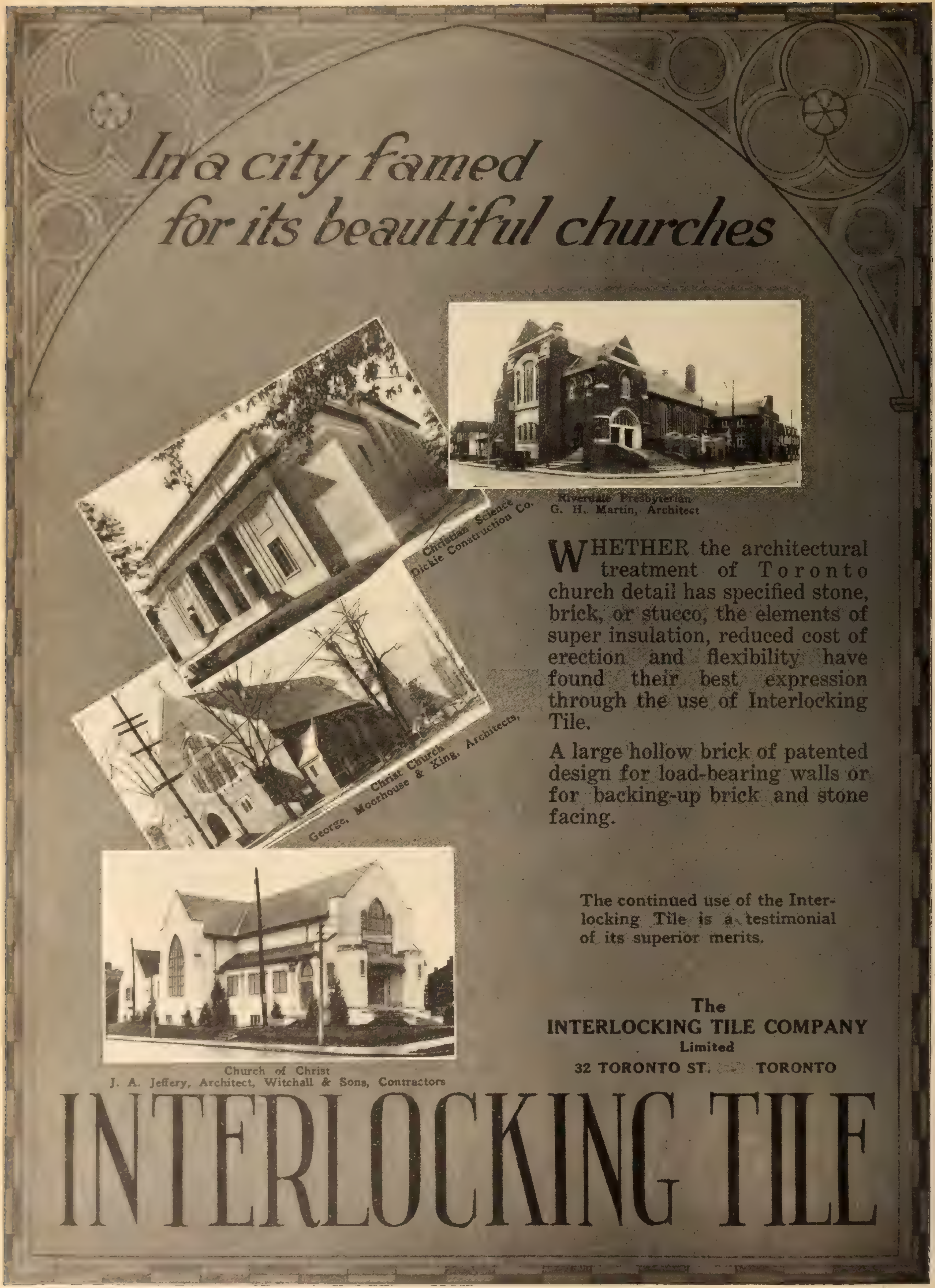

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[illegible] Architectural Iron Works
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Mussens Limited

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Hopkins & Co., Ltd., F. H.
Leckie Co., John

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Canadian Blower and Forge Co.
Sturtevant, B. F. & Co.

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F. H. Hopkins & Co., Ltd.
Inglis Company, John
McGovern, T. J.
Mussens Limited
Waterous Engine Works Co.

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Trades Labor Branch Dept. Public Works

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Boxes (Valve)
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Canadian Blower & Forge Co.

Brick Machinery & Supplies
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Harbour Brick Co.
York Sandstone Brick Co.

Bridges
Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
Standard Steel Construction Co.

Bridges (Steel)
Canadian Des Moines Steel Co.
Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
McGregor & McIntyre
MacKinnon Steel Company
Sarnia Bridge Company

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Canadian Austin Machinery
Canadian Link-Belt Co.
Canadian Mead-Morrison Co.
Hopkins & Co., Ltd., F. H.
Mussens Limited
Orton & Steinbrenner Co.

Buckets (Clamshell)
Industrial Works

Buckets, (Grab)
[illegible]

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Canadian Link-Belt Co.
Mercer Bros.
Muldoon Ltd., J.
Oakley & Sons, Geo.
Rogers Supply Co.
Standard White Lime Co.
Vitrified Clay Pipe Publicity Bureau

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Standard Steel Construction Co.

Building Specialties
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Dominion Wire Rope Co., Ltd.
Greening Wire Co., B.
Mussens Limited
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Mussens Limited

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Canadian Equipment Co.

Cars Wheels
Canada Iron Foundries

Carrier Systems
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Castings—Grey Iron
Canada Iron Foundries
Engineering & Machine Works of Canada Ltd.
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H. Mueller Mfg. Co., Limited

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Mercer Bros.
Muldoon, Ltd., J.

Cement Gun
Cement Gun Co.
F. H. Hopkins & Co., Ltd.

Cement Hardener
Canada Cement Co.
Rogers Supply Co.
Spielman Agencies Regd.

Cement Waterproofing
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.

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Canadian Blower & Forge Co.
F. H. Hopkins & Co., Ltd.
London Concrete Machry. Co.

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Canadian Link-Belt Co.

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Canadian Inspection & Testing Laboratories

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Summerhays & Co., Wm.
Vitrified Clay Pipe Publicity Co., of Canada Ltd.

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Orton & Steinbrenner Co.

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Canadian Equipment Co.

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Canadian Link-Belt Co.
Canadian Mead-Morrison Co.
General Products Co.
Industrial Works
Koehring Co., of Canada
Turnbull & Co., Harvard

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Deslauriers Metal Products Co.

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London Concrete Machry. Co.

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London Concrete Machry. Co.

Concrete Culvert Pipes
Dominion Concrete Company

Concrete Machinery
Canadian Austin Machinery
F. H. Hopkins & Co., Ltd.
Koehring Co., of Canada
London Concrete Machry. Co.
Mussens Limited
Watson Jack & Co.
Wettlaufer Bros.

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Canadian Austin Machinery
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
Mussens Limited
Turnbull & Co., Harvard
Watson Jack & Co.
Wettlaufer Bros.

Concrete Hardner
Spielman Agencies Regd.

Concrete Sewer Pipe
Dominion Concrete Company

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Conduits Company, Limited
National Conduit Company
Vitrified Clay Pipe Publicity Bureau

Conduits (Wooden Pressure Creosoted
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Webster & Trory

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Mussens Limited

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Industrial Works

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Canadian Equipment Co.
Canadian Link-Belt Co.
Canadian Mead-Morrison Co.
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Erie Steam Shovel Co.
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Crushed Stone, Limited
Hagersville Crushed Stone Co.
Hagersville Contracting Co.
Hagersville Quarries Ltd.
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Queenston Quarries Co.
Rogers Supply Co.
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Standard White Lime Co.

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Mussens Limited
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Queenston Quarries Co.

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Clyde Iron Works Sales Co.
Hepburn, Ltd., John T.
Hopkins & Co., Ltd., F. H.
Mussens Limited
Turnbull & Co., Harvard

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Canadian Austin Machinery
F. H. Hopkins & Co., Ltd.
Mussens Limited

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Canadian Equipment Co.
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Dredges
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Sturtevant, B. F. & Co.

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Dominion Truck Equipment Co.
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Canadian Equipment Co.
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MacKinnon Steel Company
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(Continued on page 8)

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This valve and Jenkins Indicator Posts are fully described in Catalog No. 9 which shows the complete Jenkins line. Free on request.

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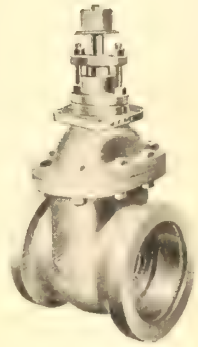
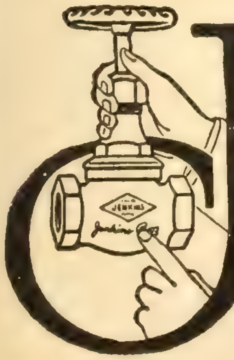


Fig. 400 F.M.

Regularly supplied to open by turning to the left. Can be furnished open right if desired.



Always marked with the "Diamond"

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SINCE 1864

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Electric Water Systems
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Otis Fensom Elevator Co.
[illegible] Elevator Company

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American Enameled Brick & Tile Company

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Fuller & Johnson Mfg. Co.
Hopkins & Co., Ltd., F. H.
Inglis Co., John
Laurie & Lamb
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Clyde Iron Works Sales Co.

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Lea, R. S. & W. S.

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Canadian Equipment Co.
Canadian Mead-Morrison Co.
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Koehring Co., of Canada
Lumsden Engineering & Contracting Co.
Monighan Machine Co.
Mussens Limited
Thew Shovel Co.

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Exhaust Heads
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Sturtevant, B. F. & Co.

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Canadian Blower & Forge Co.

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Sturtevant, B. F. & Co.

Fans, Multivane
Sturtevant, B. F. & Co.

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Sturtevant, B. F. & Co.

Fans, Silentvane
Sturtevant, B. F. & Co.

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Chew, Manley

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Laurie & Lamb

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Rawplug Co., of Canada

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Western Steel Products Limited

Floor Stands
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Eaton & Sons, J. R.

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Angstrom & Verochio
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Canadian Mead-Morrison Co.
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Mussens Limited
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Kerr Engine Company
Gartshore-Thompson Pipe Co.
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Milton Hersey Company

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MacKinnon Steel Company

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American Lead Pencil Co.

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Standard Lime Co.
Muldoon, Ltd., J.

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Deschambault Quarry Sorpn.

Hydrated Lime
Standard White Lime Co.

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Ball Engine Co.
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Canadian Equipment Co.
Canadian Link-Belt Co.
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Hamilton Co., Wm.
Horton Steel Works, Ltd.
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Hopkins & Co., Ltd., F. H.
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Hopkins & Co., Ltd., F. H.
Mussens Limited

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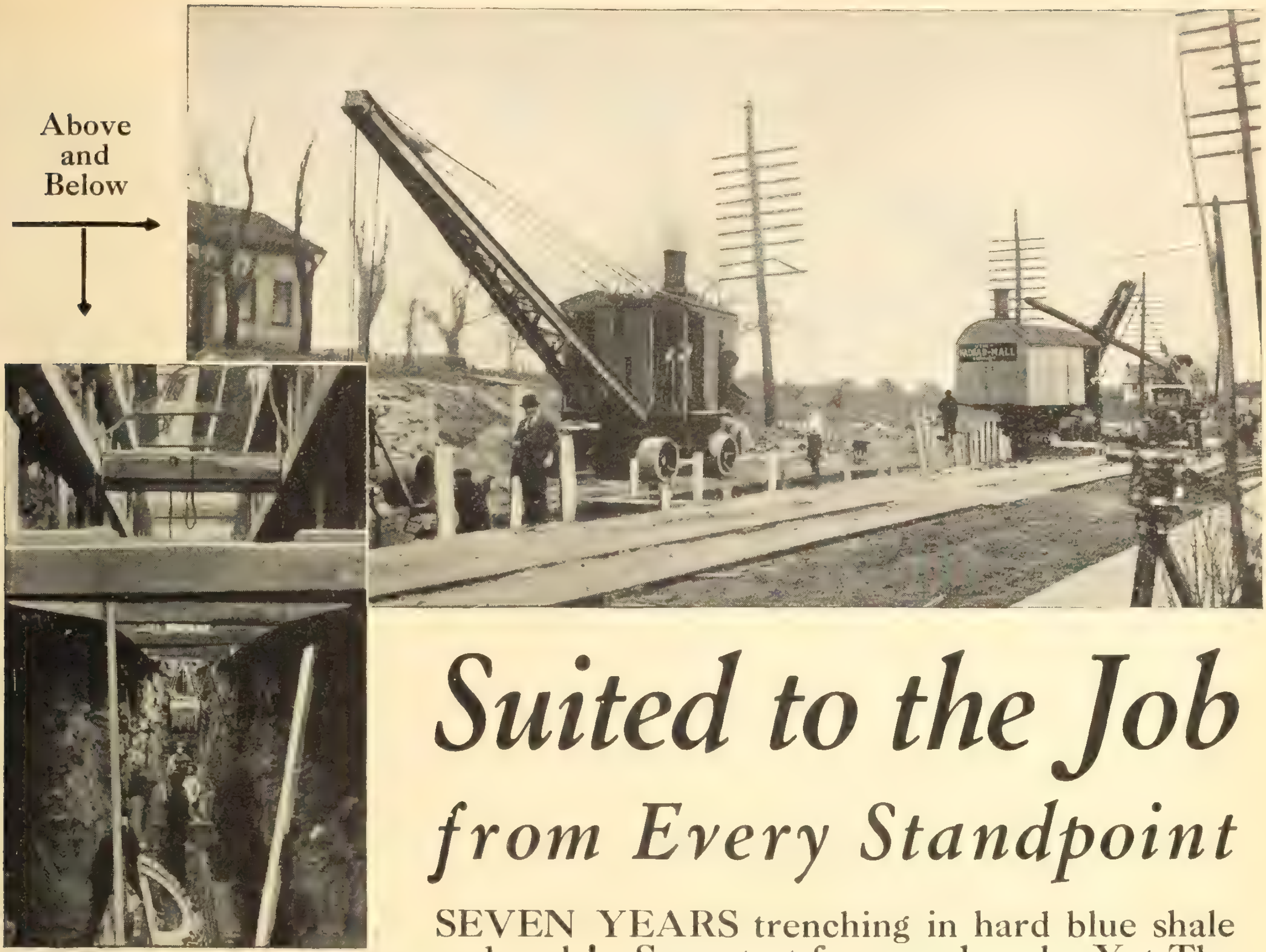
and
Below



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Shovels that will do this are worth getting acquainted with. Write for Bulletin 113 and find out some more facts about the Type A-1 Thew.

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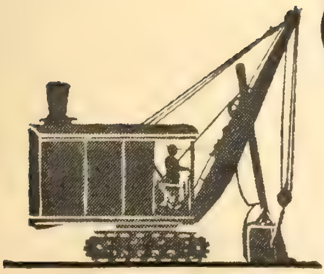
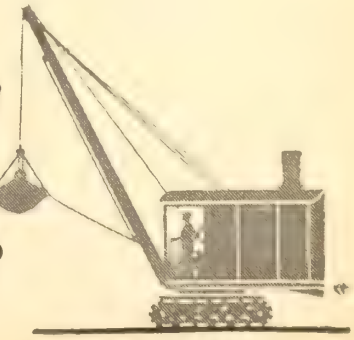


Thew
Power Shovels



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[illegible]

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Canadian Equipment Co.
Canadian Mead-Morrison Co.
Erie Steam Shovel Co.
Hopkins & Co., Ltd., F. H.
McGovern, T. J.
Mussens Limited
Osgood Company
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Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
MacKinnon Steel Company
McGregor & McIntyre
Standard Steel Construction Co
Waterous Engine Works Co.

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Canadian Equipment Co.
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Hopkins, & Co. Ltd., F. H.
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Standard Steel Construction Co.

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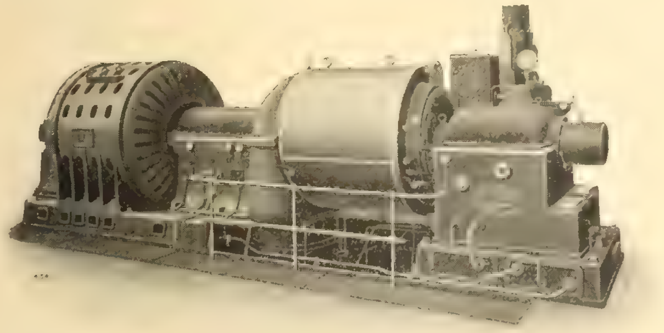

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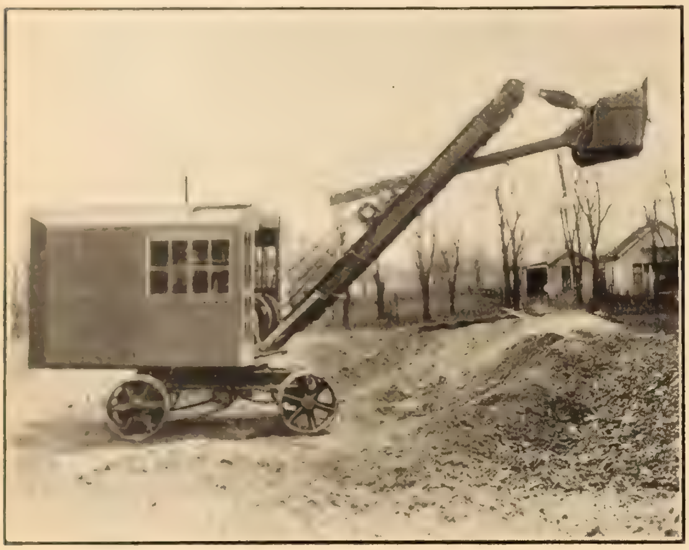

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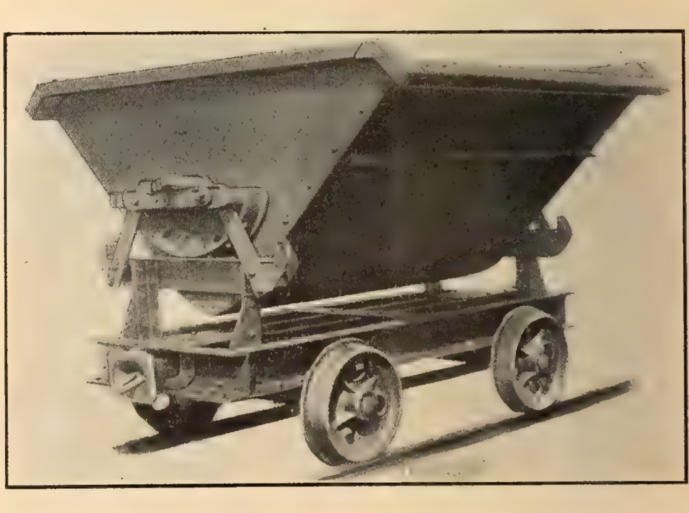

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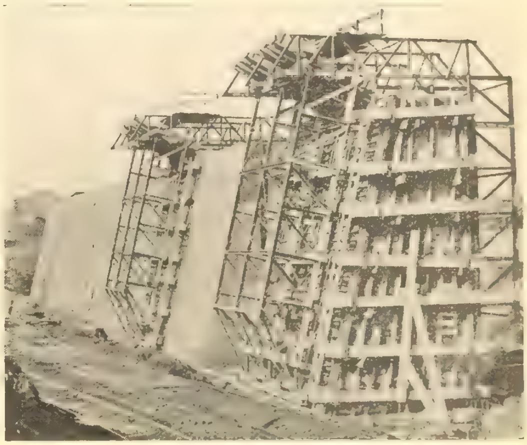

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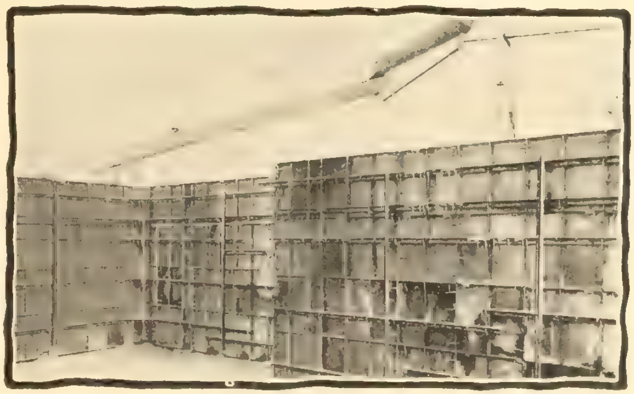

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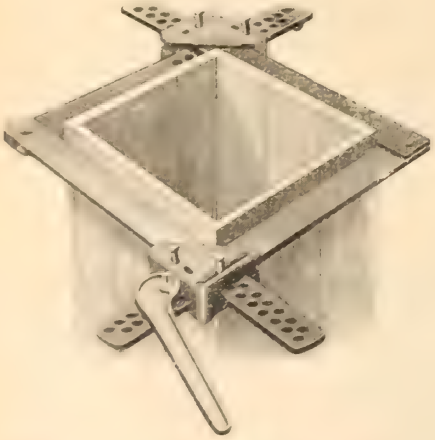

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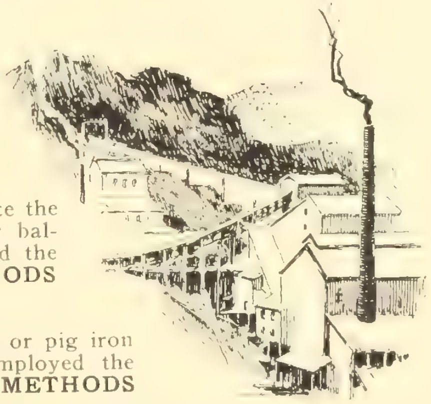

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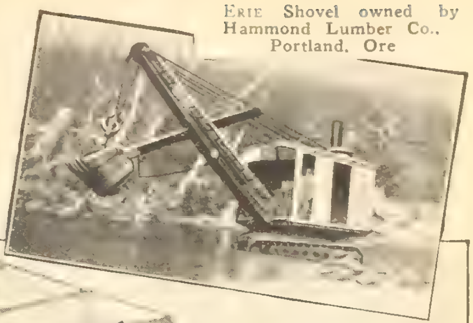
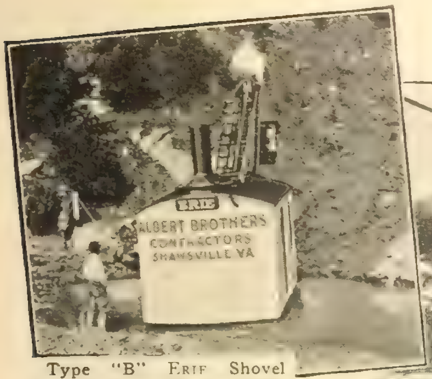
Caterpillar type Erie owned by L. J. Chandler, Virgilina, Va. crossing south branch of Potomac River.

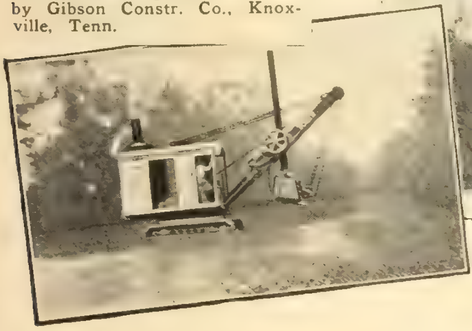
Erie Shovel owned by Hammond Lumber Co., Portland, Ore

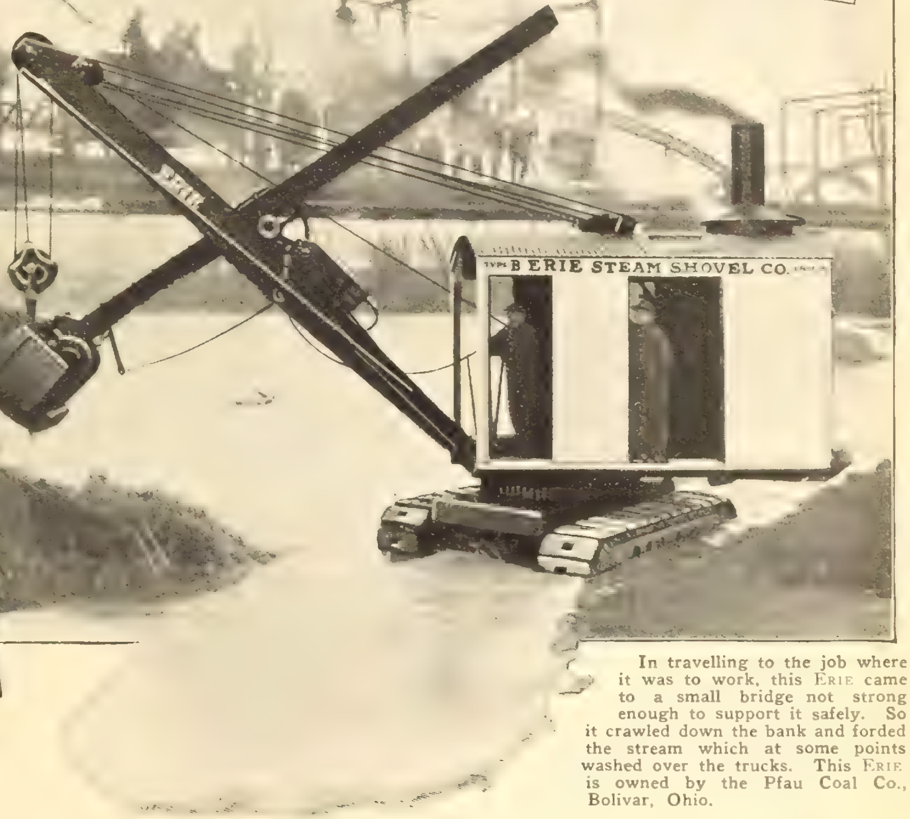




Type "B" Erie Shovel owned by Albert Bros. Shawsville, Va., working in creek bed with water up to the cab floor.

Erie Shovel one caterpillar type mounting, fording Blue Water Creek near Knoxville, Tenn. After crossing the Creek, the Erie climbed a 25% bank to reach solid ground. Owned by Gibson Constr. Co., Knoxville, Tenn.





In travelling to the job where it was to work, this Erie came to a small bridge not strong enough to support it safely. So it crawled down the bank and forded the stream which at some points washed over the trucks. This Erie is owned by the Pfau Coal Co., Bolivar, Ohio.

Get "In the swim!"

With an Erie Shovel on caterpillar type mounting, you ford a stream as easily as you move over dry land. Contractors have written us some enthusiastic letters about the "submarine" performance of their Eries.

Creek bottoms usually run either stony and rough, or muddy and very soft—and a rough or soft bottom calls for the Erie caterpillar type mounting. **The complete lubrication** system of the Erie mounting is not affected by water—the lubricant used forms a sticky seal and keeps the water out.

It is **complete lubrication** of link-pins and rollers that makes the Erie Shovel the champion climber, and speediest traveler. Caterpillar type Eries have taken grades of 30% or even steeper—and they travel much faster than steam shovels which run the link-pins without oil. **And needless to say, last much longer.**

The same "designing brains" which made this better mounting produced the entire ERIE Shovel

The Erie Shovel is as far ahead in digging as in traveling; it stands up better, being built to a higher standard through and through. Owners report that their Erie Shovels cost only about 1/3 as much for upkeep. **The saving in actual repair cost is important—but even more important is the saving in working time, and assurance of steady operation.**

As you probably know, a large majority of excavating contractors prefer the Erie Shovel. There are many reasons for this preference, but the most important reason of all is—**the Erie's unequalled reliability.**

In our Bulletin C-16 you will find a lot of photos showing what the Erie can do. Drop us a line for Bulletin C-16.

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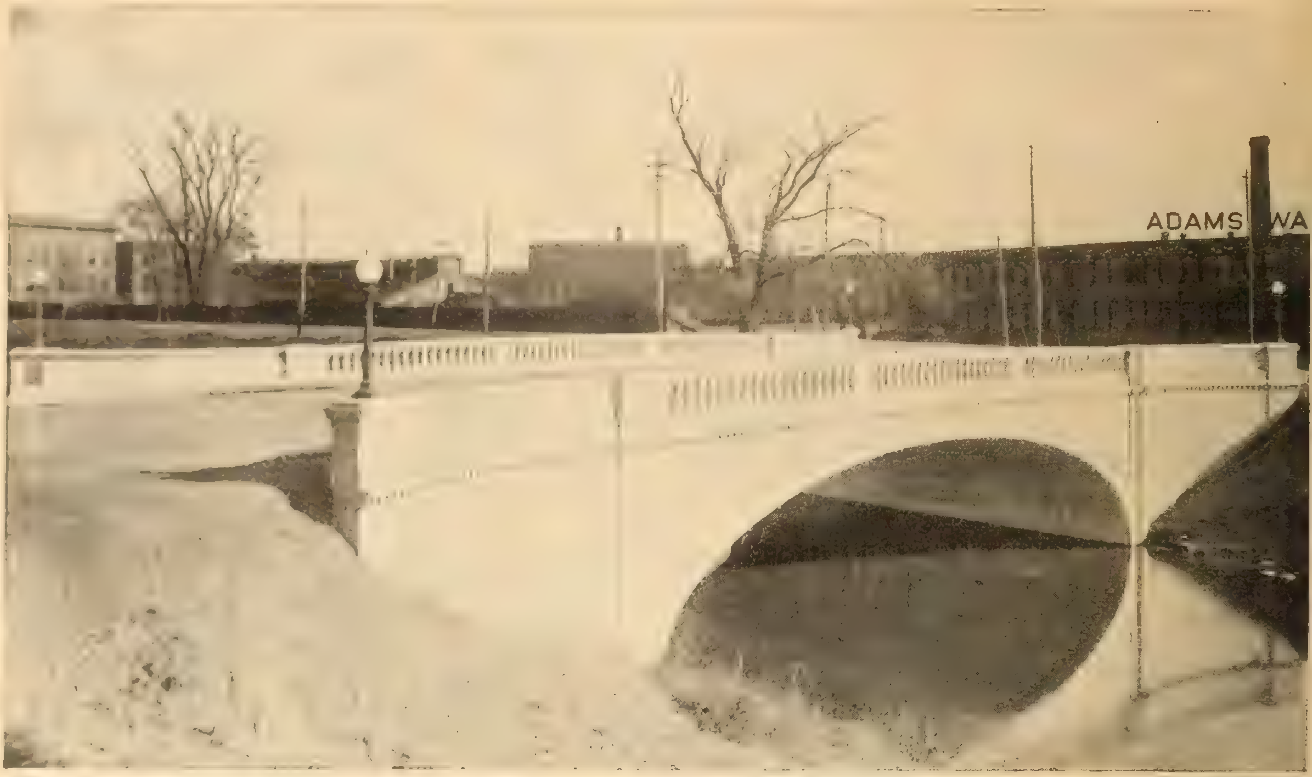
***Incorporated 1883; formerly* BALL ENGINE CO.**

ERIE Revolving Shovels
ERIE Steam Shovel Co Erie Pa



Murray Street Bridge, Brantford, Ontario

BRIDGE BEAUTY EXEMPLIFIED

IN A CONCRETE STRUCTURE AT BRANTFORD, ONTARIO

Grace of line and pleasing simplicity characterize the bridge erected at Brantford, under the supervison of Frank P. Adams, A.M.E.I.C., Brantford's City Engineer.

The arch ring is a solid barrel arch, the intrados being an ellipse. The span of the arch is 60 ft., the rise 12 ft., width 48 ft., and thickness of crown 18 inches. The arch ring is reinforced with 1 inch square corrugated bars at 12 inch centres placed 2 inches from intrados and extrados of the arch. ½-inch square corrugated bars are placed at right angles to the main reinforcement at about 36 inch centres.

The abutments are of solid concrete mixed in proportion of 1 to 7 pit run gravel and the arch ring is mixed in proportion of 1 to 4 pit run gravel.

Spandrels and wing walls are plain concrete gravity type retaining walls, mixed in proportion of 1 to 4 pit run gravel.

The wing walls are curved on a radius of 35 feet. The concrete railing is of the open baluster type over the arch ring and solid over the abutments.

The base, posts and railing were cast solidly in place and the baluster posts were made up on the ground. The many advantages of Concrete in the construction of bridges are now widely appreciated.

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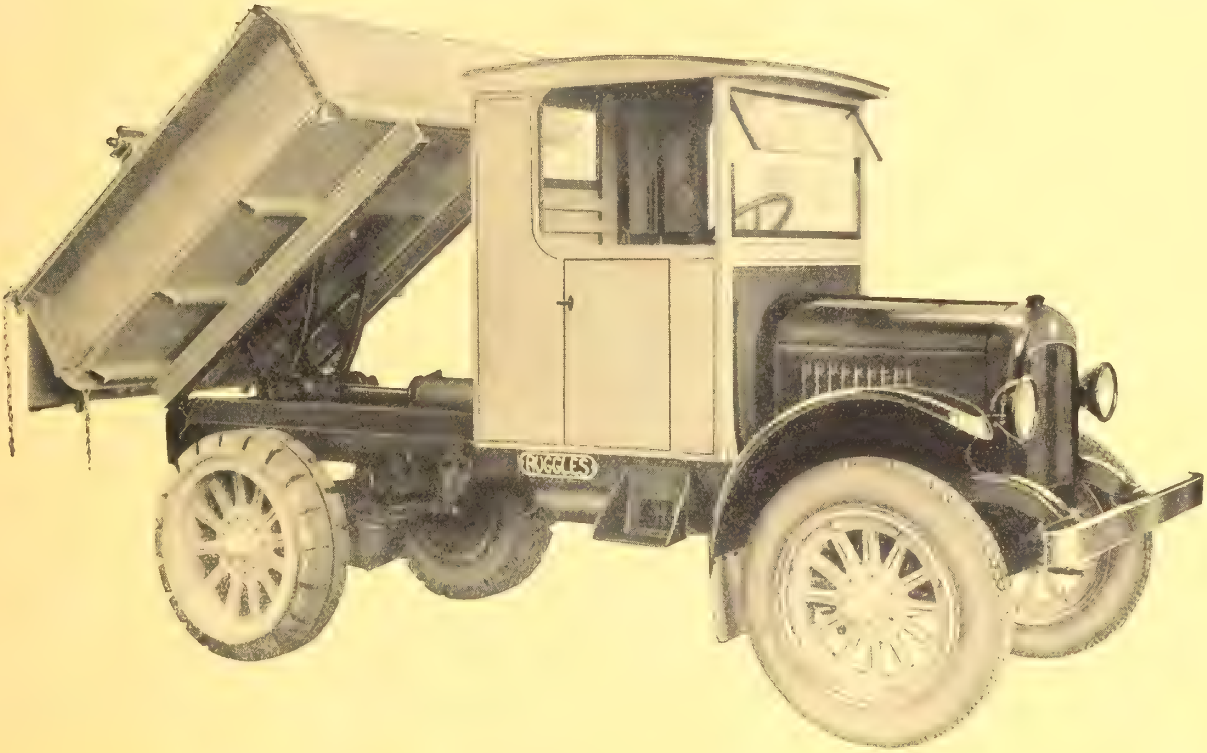

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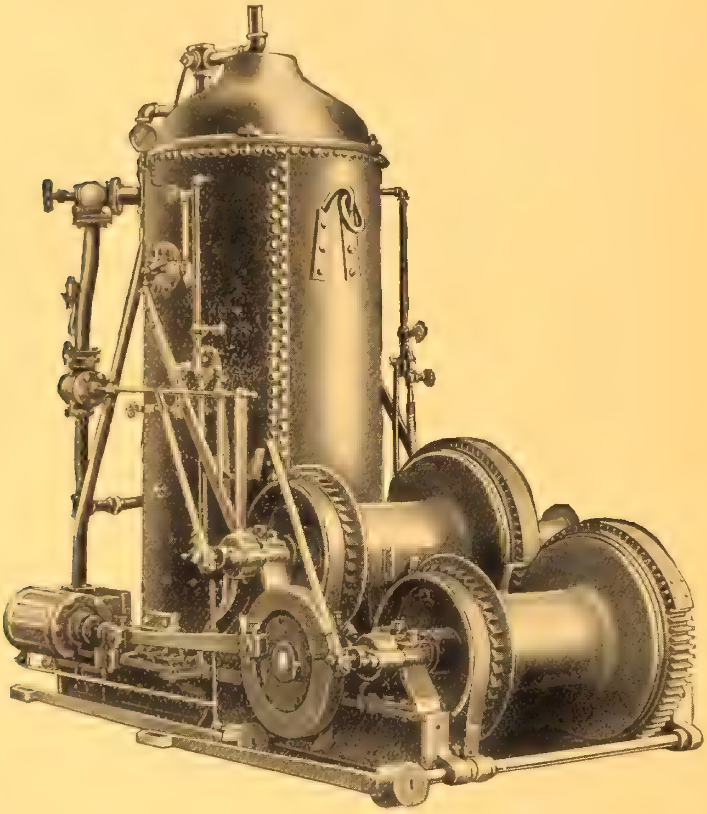

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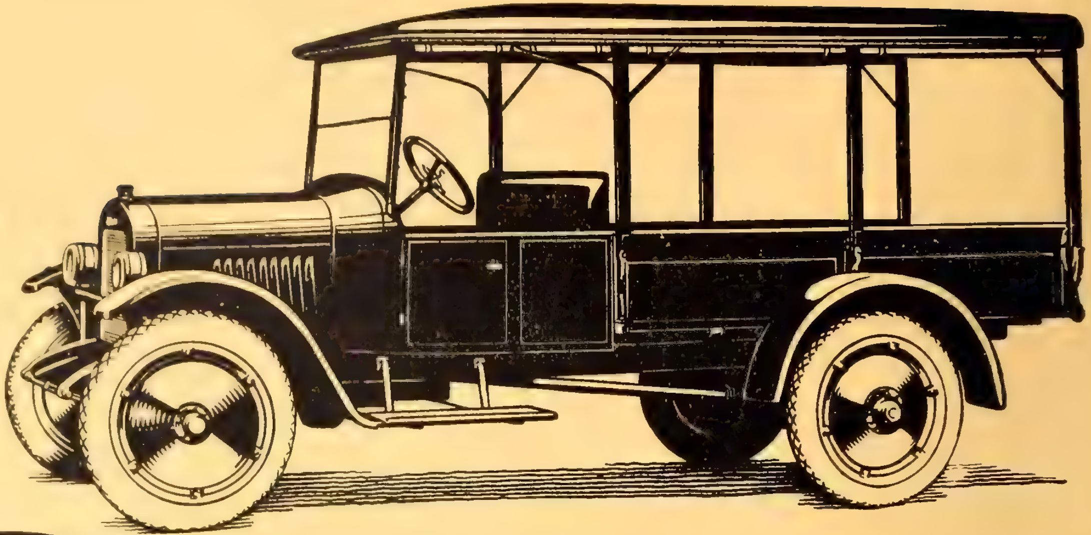
Bodies for Every Business



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On all major points the new Stewart one-ton truck matches trucks costing from $2000 to $2300 Check the specifications. Or better still come see and compare it with speed trucks costing from $500 to $800 more. Many important standardized parts are the same. In other features Stewart excels even these costlier trucks. The frame for instance is sturdier; bigger bearings; longer, stronger springs. Modern 5-bearing crankshaft motor. Fast, powerful, reliable. Not a one year truck. Built to last for years in steady economical duty. Deep, cushion seats for driver comfort. An examination will convince you. **With body and complete equipment the Stewart one-ton truck costs less than the chassis alone of many trucks which it will out-perform and outlast.**

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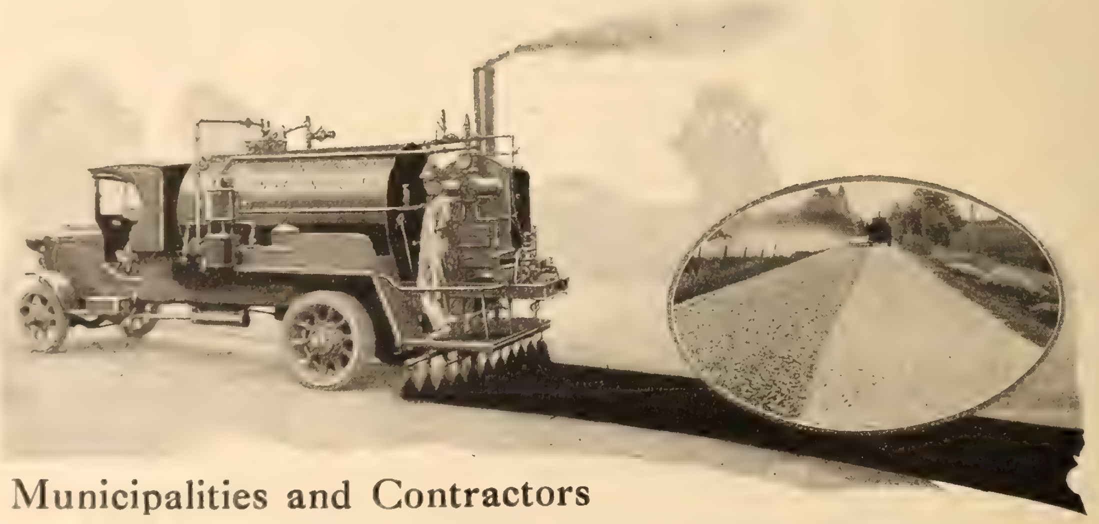

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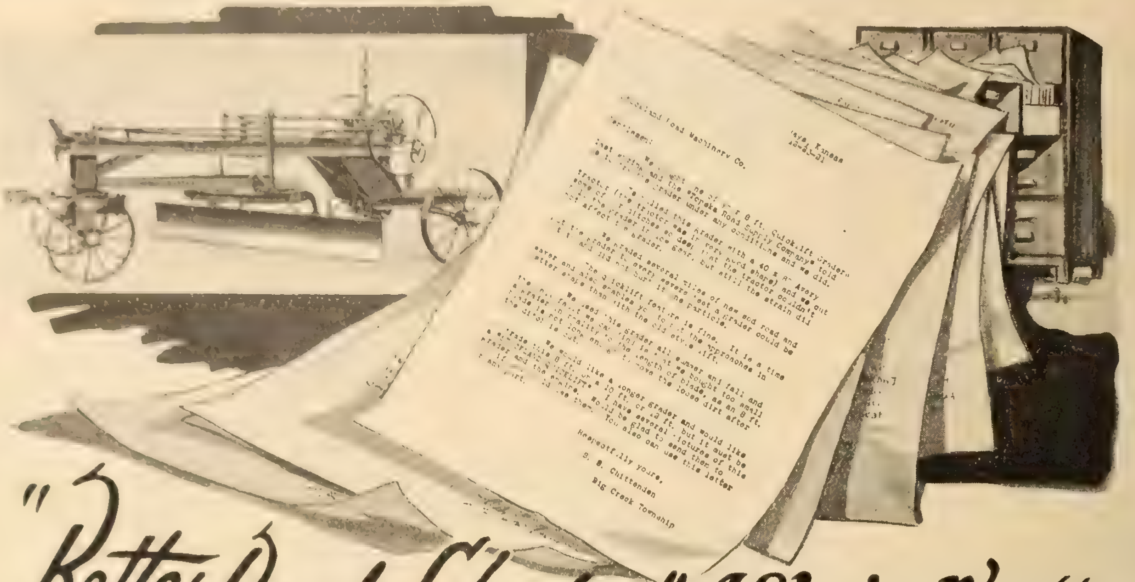

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Is ***your*** letter among the many in our files? If not, just reflect — it is Stockland Performance that inspires such heaping satisfaction. In one state out of the 42 where Stocklands are extensively used there are over a thousand machines in service.

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Ease and flexibility of operation is an outstanding Stockland advantage. Yet the Stockland design does not favor this advantage at the expense of earth-moving capacity, or power economy.

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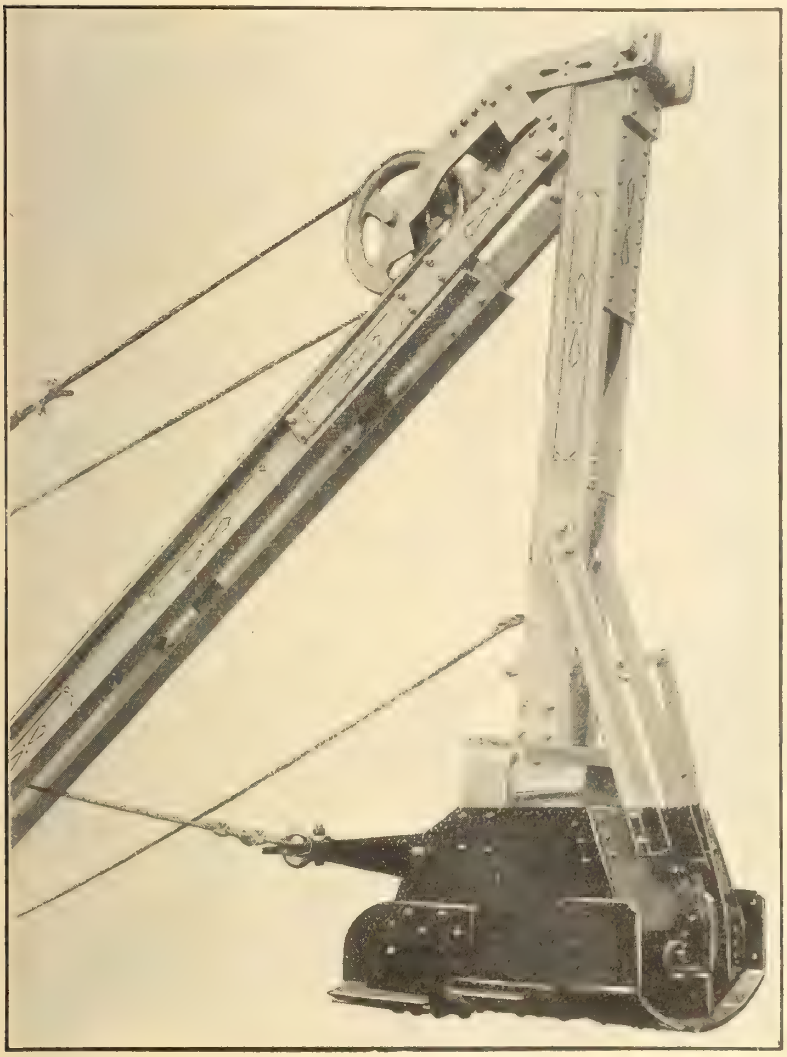
The Ditcher Scoop on the Keystone Excavator Model 4'23



A "close up" of the new Drop Bottom Ditcher Scoop

Here is an outstanding improvement that adds greatly to the efficiency and capacity of the Keystone Excavator, Model 4'23.

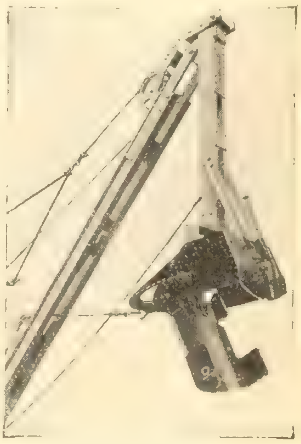
The drop bottom feature, operated by the usual trip rope, allows speed and positive accuracy in depositing the material in wagons or trucks.

The Ditcher "stick," or auxiliary boom, is heavier and of box girder construction in place of the single I beam, and is therefore stronger and more rigid.

This new Drop Bottom Ditcher Scoop is now standard equipment on the Keystone, having been thoroughly tested for a full season. Present Keystone users can equip their machines with it as there is no change in the Boom itself.

Stronger—More Rugged!

The whole construction of this Ditcher Scoop and "Stick" is heavier and more rugged than the former Ditcher. The drop bottom feature is a notable development. The new Ditcher is made in various widths, 14 in., 18 in., 20 in., 24 in., 30 in., 42 in. The 30 in. and 36 in., being the most generally used sizes. Capacity, in the average ½-yd., gives excellent speed down to 16 ft. depth, digging out up to 300 cu. yds. per day in any soil.



Drop bottom open—material falls directly in truck or wagon

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Here is a letter from an actual Keystone operator.

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1. Convenient arrangement of levers, doing away with all reaching or straining.
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7. Efficient 32 h.p. boiler and engine with ordinary fuel, hard steaming unheard of.
8. Improved Skimmer and Ditcher Scoops enable me to do clean work and get good results.
9. Planetary gear drums giving plenty of punch for hard digging.
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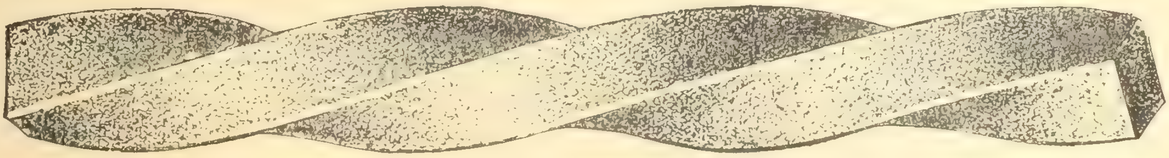

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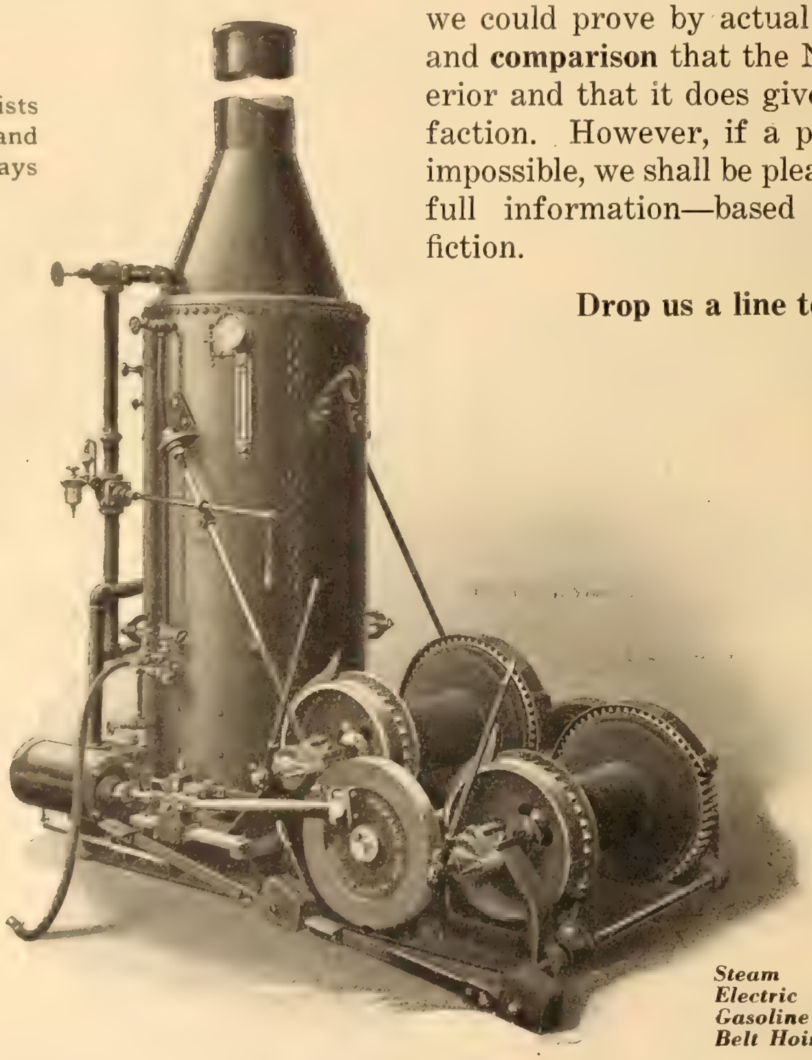

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The excellent service which the manufacturers of Interprovincial Brick are able to extend to the contractor, together with the well know qualities of the brick itself, are facts which those who use or specify building materials should always keep in mind.

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Antimo White reduced with similar quantity of Oil has 50% **more** hiding power than pure White Lead. Therefore, **two** coats will do the work of three coats of Pure White Lead.

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There is no finer flooring made than Empire Brand, yet it comes at a price which makes it unequalled in value.

Recognition of its superiority is found in its use in many of Canada's finest buildings, where nothing but the best is tolerated.

Empire Brand Flooring is made in Maple, Birch and Plain and Quartered Oak.

Let us quote prices on your requirements

J. R. EATON & SONS LIMITED
ORILLIA — — ONTARIO

**RENFREW BRAND
HARDWOOD FLOORING**

Oak - Birch - Maple

RENFREW R BRAND

Let us send you our latest quotations

Renfrew Lumber Company
(Owned and operated by M. J. O'Brien, Limited)
Renfrew, Ont.

Sash, Blinds, Doors, Door Frames, Mouldings, Lath, Shingles,
Rough and Dressed Lumber

The Place to Go for

SAND

Service ***Satisfaction***

For Prompt Service, Call

General Office	.........Main 8046
Cartage Office	.........Main 5385
Tramway Service ..	..........Vict. 1745
Scales, Ottawa St. .	.........Main 8047
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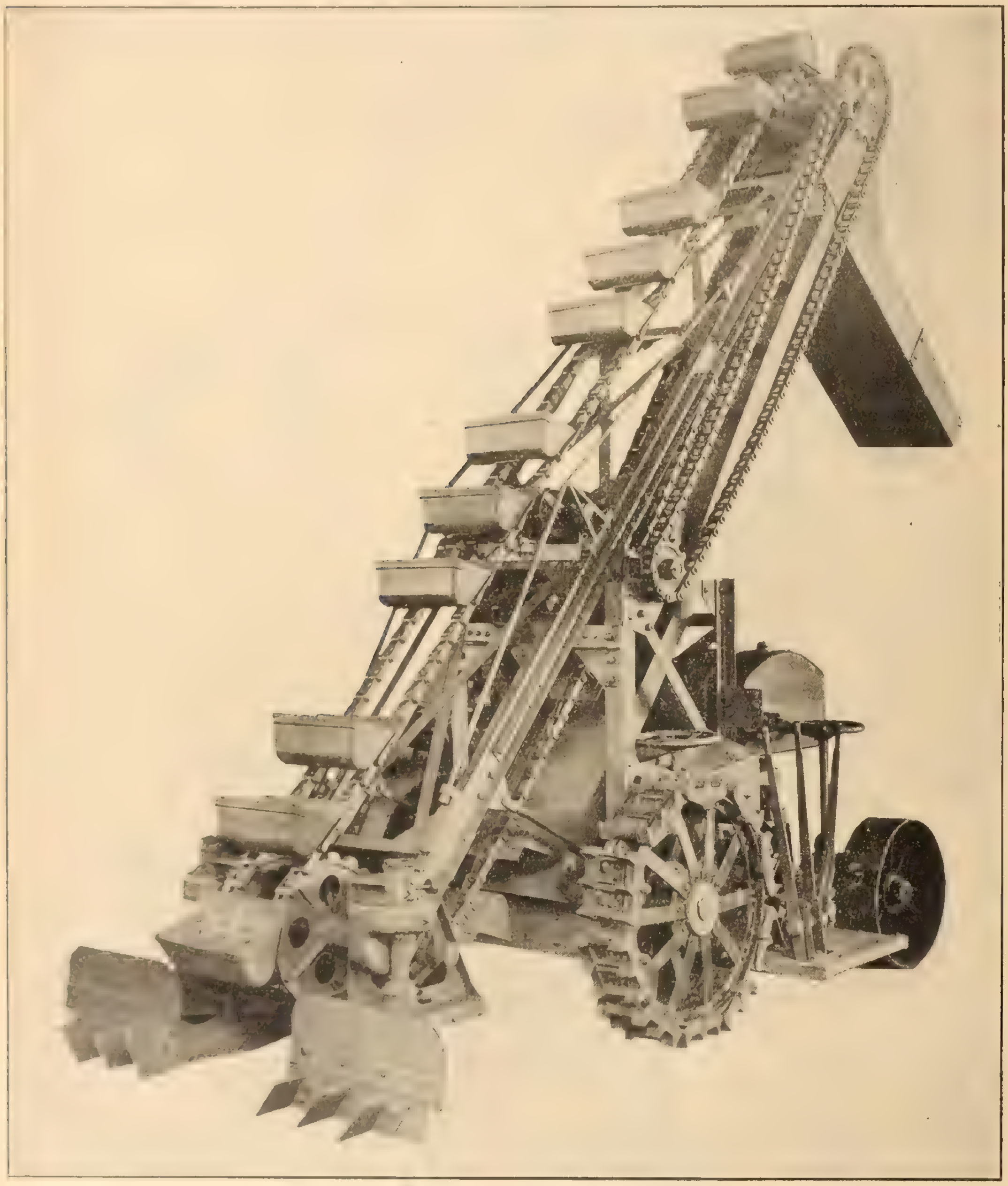
Consolidated Sand Company

LEON GELINAS, MANAGING DIRECTOR

Head Office: 270 Ottawa St., Montreal

AUSTIN WAGON LOADERS



AUSTIN GRIP-WHEEL LOADER

AUSTIN MACHINERY
"MOVES THE EARTH—MIXES THE CONCRETE"
TRADE MARK

AUSTIN
LINE INCLUDES

- CONCRETE MIXERS
- CONCRETE PAVERS
- ASPHALT PLANTS
- DRAGLINES
- BACKFILLERS
- ROAD TAMPERS
- POWER SHOVELS
- TRENCHERS
- INDUSTRIAL CARS
- LOCOMOTIVES

AUSTIN MACHINERY
"MOVES THE EARTH—MIXES THE CONCRETE"
TRADE MARK

AUSTIN LOADERS can be supplied with all multipedal traction, plain wheels, or Grip Wheels as illustrated. All are **one man** machines and all are equipped with the famous Austin Feeding Device, the most positive known.

AUSTIN LOADERS have a very large capacity, from 1 to 1½ cu. yds. per minute with a digging width of 7 ft. and a discharge height of 9 ft. 2 in.

AUSTIN LOADERS will handle loose bulk materials such as crushed stone, gravel, sand, coal, etc., at a fraction of the cost of hand work. Write for descriptive literature.

CANADIAN AUSTIN MACHINERY LIMITED

WOODSTOCK, ONT.

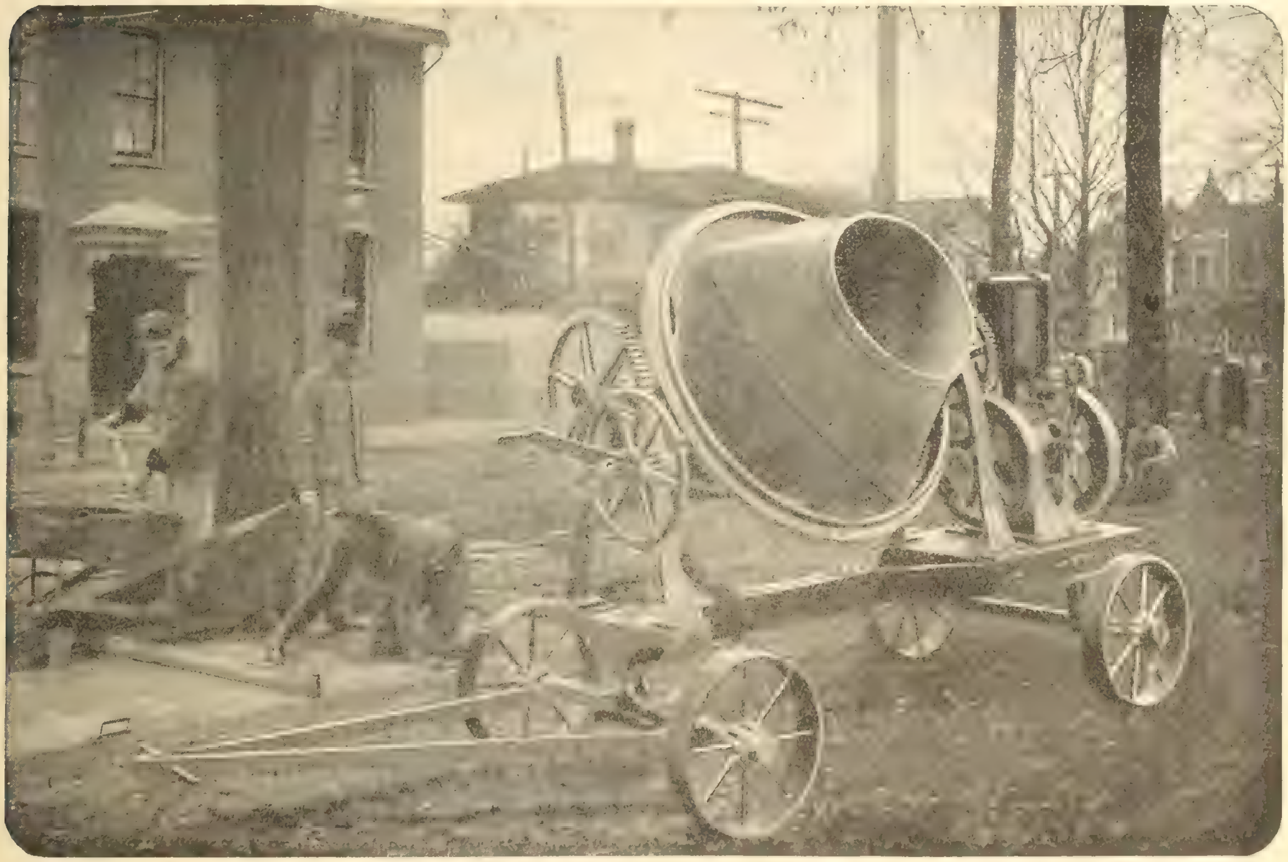
Provincial Sales Agents

Alberta: McAuley, Bell & Morris, Calgary.
B.C.: Dominion Commercial Co., Vancouver.
Man. and Sask.: J. L. Neilson, Co., Winnipeg.
Ontario: Dominion Industrial Products Co. Ltd., Toronto.
Quebec: M. W. Davidson, Montreal.
Maritime: Frank A. Gillis Co., Halifax.

AUSTIN
MACHINERY
"MOVES THE EARTH—
MIXES THE CONCRETE"
TRADE MARK

The CUB~HEX

A LIGHT~TYPE PORTABLE CONCRETE MIXER



THE PROFITABLE MIXER FOR THE SMALL JOBS

Ordinary foundations, sidewalks, curbs, gutters, silos, tanks, culverts, floors and similar work not requiring the greater capacity of the larger size mixers can be more profitably handled by means of the "CUB HEX".

Its greater speed and the perfect mix, possible only with the famous Austin Cube principle, will save the contractor many dollars on the smaller jobs.

Its output of perfectly mixed concrete, or mortar cannot be equalled by any other type of mixer, and it has honestly earned its reputation as the GREATEST UTILITY MIXER ever produced.

Illustration shows engine exposed; standard equipment is supplied with sheet metal housing entirely enclosing same.

Write us for descriptive literature, prices, etc.

CANADIAN AUSTIN MACHINERY LIMITED

WOODSTOCK, ONT.

Provincial Sales Agents

Alberta: McAuley, Bell & Morris, Calgary.
B.C.: Dominion Commercial Co., Vancouver.
Man. and Sask.: J. L. Neilson Co., Winnipeg.
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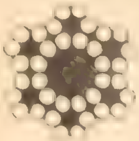
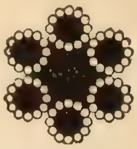
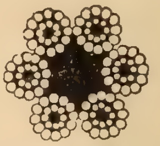


6 x 6
6 strands of 6 wires
Hemp in
strands and core



6 x 12
6 strands of 12 wires
Hawser make

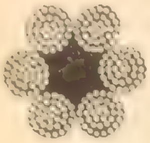


6 x 24
6 strands of 24 wires
Hemp in
strands and core

WIRE ROPE

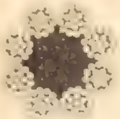
FOR EVERY SERVICE

TRADE MARK



6 x 37
6 strands of 37 wires
Hemp core

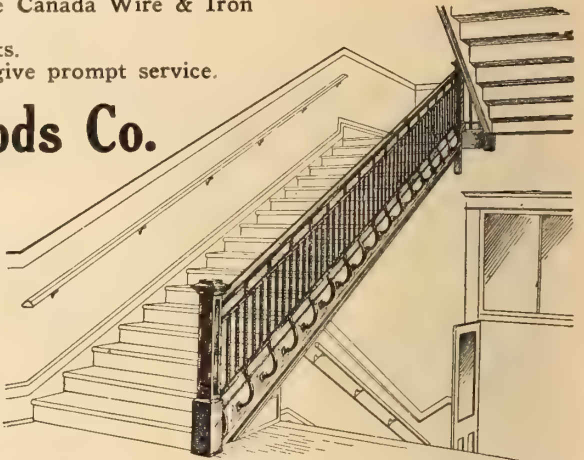
Absolute dependability is a prime essential of all wire rope and a well known characteristic of all wire rope bearing the Canada Wire & Iron Goods' trade mark.
Let us quote you on your wire rope requirements.
We also fabricate builders' Iron Work and can give prompt service.

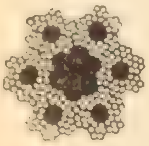


8 x 19
8 strands to 19 wires
Hemp core

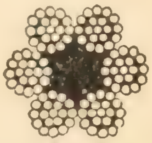
Canada Wire & Iron Goods Co.

Hamilton, Canada

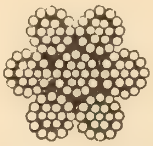




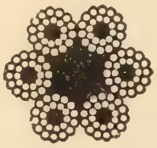
6 x 7
Cable Laid Rope



6 x 19
6 strands of 19 wires
Hemp core



7 x 19
6 strands of 19 wires
Wire cord



6 x 24
6 strands of 24 wires
Hemp core

For Satisfaction Try "Eansor Service"

A review of the past few season's building activities shows that "Eansor Service" has been connected with the majority of large contracts and small jobs in the Border Cities.

We are now installing the entire miscellaneous Iron Contract in the mammoth new Ford Motor Co.'s Machine Shop and Docks.

See us whenever it's a question of—

STRUCTURAL STEEL
ORNAMENTAL IRON
BUILDING SPECIALTIES

T. J. EANSOR & SONS

300-310 Pitt St. East Windsor, Ont.

KEWANEE COAL CHUTES

Include a Kewanee in your specifications

YOU may consider it a minor detail in your construction plans, but the lasting service a "Kewanee" Coal Chute gives year in and year out will testify to your sound judgment in building construction. They are made entirely of steel—no castings, and are absolutely guaranteed against breakage. They protect the surrounding wall. Made the better way.

Attractive-Convenient-Economical

—As Permanent as the Foundation—

Kewanee Coal Chutes preserve the appearance of the home; are convenient to operate—are unbreakable. Three good reasons why you should send for complete description and prices.

Although we guarantee "Kewanee" Coal Chutes, and thousands are in use, no purchaser has ever found it necessary to avail himself of this guarantee.

Your next job deserves a "Kewanee".

Write for Particulars and Prices

CAST STONE BLOCK & MACHINE COMPANY - LIMITED

1438 Howard Avenue **Windsor, Ontario**

Kewanee Manufacturing Company, Kewanee, Ill.

Mount Royal Hotel
Montreal

Architects—Ross & MacDonald
Contractors—Thompson.Starrett Co., Ltd.

Structural Steel Protected with SUPERIOR GRAPHITE PAINT

Architects and engineers the country over—and building owners as well—pin their faith on SUPERIOR GRAPHITE PAINT, because they know through experience and observation it can be used with definite assurance of service and satisfaction.

On this basis it is not surprising that SUPERIOR GRAPHITE PAINT was selected for the protection of the structural steel used in the Mount Royal Hotel. Its service record in many of the representative structures throughout the country was a determining factor in its selection.

SUPERIOR GRAPHITE PAINT is one of the DEGRACO line of dependable paints, which includes STA-WHITE—the light reflecting paint that stays white; DEGRACO-TONE-flat wall paint; Degraco Brick and Concrete Paints; Degraco House Paints and Varnish; Dampproof Coatings, Enamels—in fact, paints in all colors for all purposes.

DEGRACO PAINTS are sold through branch offices with warehouse stocks in all principal cities. Their use eliminates the hazard of experiment.

Montreal
Quebec
Toronto
Calgary
Edmonton

DOMINION PAINT WORKS, LIMITED
WALKERVILLE, CANADA

Winnipeg
Halifax
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Regina

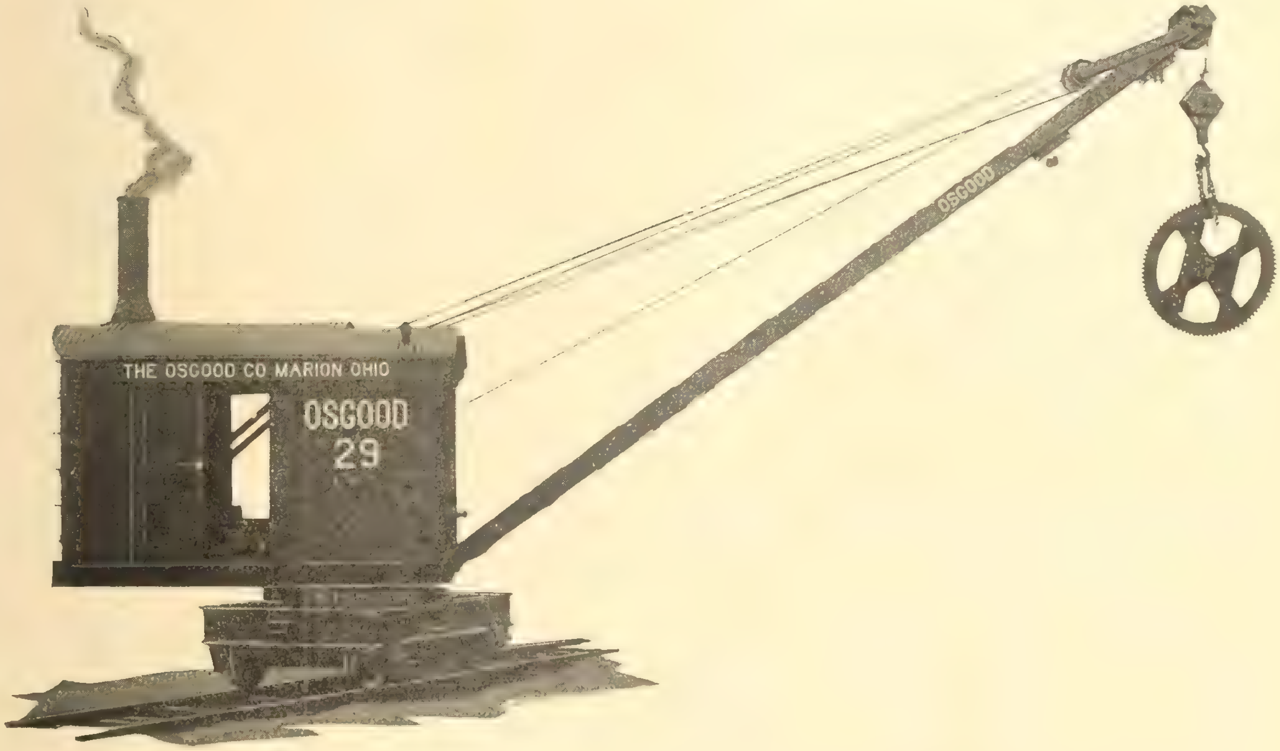
DEGRACO All Colors for All Purposes

PAINTS
VARNISHES
ENAMELS

Full Revolving - Self Propelling

CRANES

THOROUGHLY REBUILT AND IN FIRST CLASS CONDITION



Two Cranes available for immediate shipment, shop Nos. 649 and 651, built 1918.

A.S.M.E. BOILERS. WILL PASS ANY INSPECTION.

PHOTOGRAPH DOES NOT SHOW BRAKE RIGGING NOR OUTRIGGERS

GENERAL SPECIFICATIONS

Builder	Osgood Co.	Truck Frame	Cast Steel
Year Built	1918	Water Tank Capacity	350 gals.
Shipping weight (Approx.)	52,000 lbs.	Boiler Feeders	Pump and Injectors
Working weight (Approx.)	58,000 lbs.	Boiler	A.S.M.E. Vertical S.T. Type
Wheel Base (Centre of axles).	about 8′ 6″	Boiler Size	50″ diam. x 100″ high
Length of Boom	45 ft.	Brakes	Steam
Construction of Boom.	Channel Iron Latticed	Width of cab	9′ 5″
Capacity	7½ tons at min. radius	Length of cab	14′ 4″
Mounting	4 Wheel R.R. Truck	Number of outriggers	Four

CANADIAN EQUIPMENT CO., LIMITED MONTREAL

285 BEAVER HALL HILL Phone: Plateau 3440

Railroad, Industrial and Contractors' Equipment

A. W. Carmichael Limited

Contractors
for
ROOFING
WATERPROOFING
ASPHALT
MASTIC
FLOORS
and
SHEET METAL WORK
of All Kinds

WE have the facilities and experience to offer you a superior service on contracts of any size. When considering roofing, asphalt-mastic floors or sheet metal work, consult us. We will be glad to co-operate in every way and submit plans and costs. See us on your next job.

Office
518 PALMERSTON AVE. HILL. 4842
TORONTO

Plant
HAMMOND PLACE HILL. 4843

Branch
90 LINCOLN RD. WALKERVILLE, ONT.

CHAINS

Dredge Hercules Steam Shovel
Sling Chain

Contractors' Chains

Specially Made in All Kinds and Sizes

WRITE, WIRE
OR PHONE

McKinnon Columbus Chain Limited

St. Catharines, Ont.

STANDARD PAVING

LIMITED

Head Office
OTTAWA, ONTARIO

Time is the essence of most paving contracts, but economy is a factor of equal importance. Only by having ample modern equipment, capable organization and wide experience can a paving contractor do the work speedily and economically. We have all three, and can prove it by performance on the many jobs entrusted to us.

Consult us on your paving work

The Largest and Best Equipped Paving and Road Building Organization in Canada

Branches:

COBOURG, Ont.
BUFFALO, N.Y.
HULL, Que.
ELMIRA, Ont.
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KITCHENER, Ont.
GALT, Ont.
WATERLOO, Ont.
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Standardized Hauling Costs Assure Definite Profits

IN contracting work the difference between profit and loss most frequently rests with the transport equipment. Mack trucks when used as hauling units enable a contractor to standardize his hauling costs and be assured they will not exceed the figure in his estimate.

Ample power and structural strength enable Mack trucks to do the hardest, heaviest kind of hauling without recourse to the repair shop every few hundred miles.

A perfected dual-reduction drive, specially designed cooling and oiling systems, crankshafts and camshafts that are case-hardened and of unusual diameters, are some of the exclusive engineering features of Mack trucks that help to keep down operating and maintenance costs.

MACK TRUCKS OF CANADA, LTD.
28-30 Vanauley St., Toronto, Ontario

REG. U.S. Mack PAT. OFF.
TRUCKS

Capacities: 1½ to 7½ tons. Tractors to 15 tons.

PERFORMANCE COUNTS

McFarlane-Douglas Co., Ltd.

execute important Contracts on new Chateau Frontenac

E. & W. S. Maxwell, Montreal,
Architects

Anglin-Norcross Ltd., Montreal
General Contractors

Another famous building equipped with our "Crown" Copper Roof, Metal Covered Doors, Hollow Metal Doors, Steel Doors, Frames and Ventilating Systems

We are proud to add the name of the new Chateau-Frontenac at Quebec City to the steadily growing list of well-known Canadian buildings in which Crown Metal Products are used. Nothing we could say about our roofing, doors, trim, etc., would be half as illuminating as the mere mention of the class of structures in which they are used.

We manufacture and contract for "Crown" Metal Products, Shingles, Sidings, Ceilings, Corr. Iron, Hollow Metal Doors and Interior Trim, Metal Covered Doors, Windows and Trim. Also any kind of roof—anywhere.

McFarlane-Douglas Co., Ltd.

50 Slater St., Ottawa, Ont.

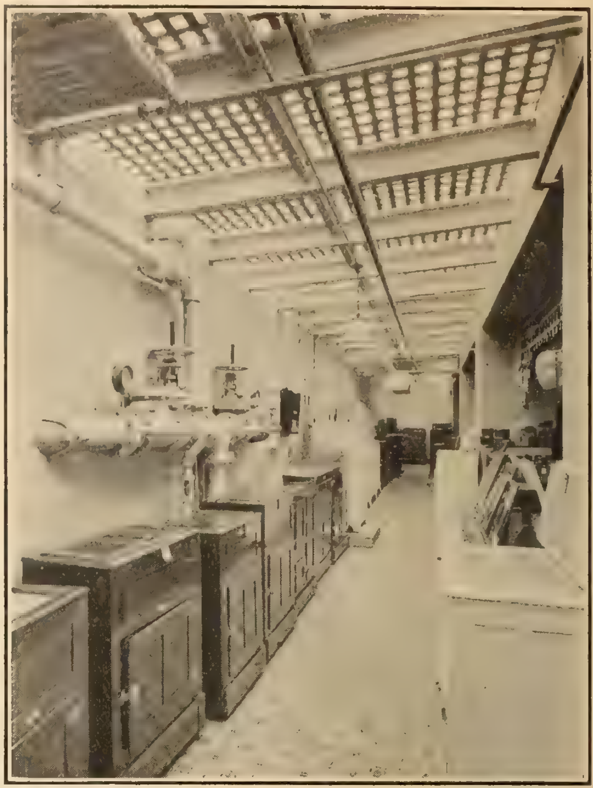
Luxfer Prism Jobs in Toronto

WE illustrate the magnificent basement of the Adams Furniture Company, Yonge St., Toronto, showing a daylight basement. Our reinforcement concrete Prism Slabs have replaced other types and are giving entire and permanent satisfaction in the following buildings:

C.P.R. Cor. King and Yonge, Standard Bank, Cor. King and Jordan, Union Bank, Cor. King and Bay, Robert Simpson Co., Cor. King and Yonge and many others.

Do not waste your basement by not having it daylighted.

Luxfer Prisms, the best and most efficient article, installed in any building.



LUXFER PRISM CO., LTD.

162 Parliament St. Toronto **Phone Main 4639**

Hardy Cartage Co.

LIMITED

The Largest Operators of
Dump Trucks in Canada

351 Front St. East, Toronto Main 1609

CONTRACTORS!

We are at your service

DOMINION TRUCK EQUIPMENT

TIME SAVERS FOR MOVING MATERIALS

Automatic Dump Bodies

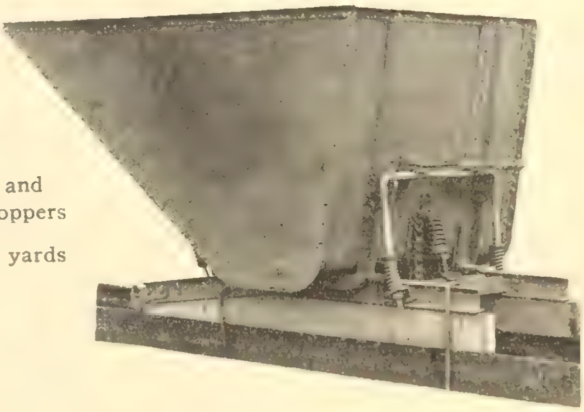
for All Makes of Trucks

FOR HAULING AGGREGATE, CONCRETE AND ASPHALT

Note Steep Dumping Angle. Driver does not Leave Seat

Single and
Dual Hoppers

1-3 cubic yards



Showing Dumping Control Mechanism Mounted on Chassis with U Bolts

UTILITY BODIES FOR ALL TRUCKS

CONTRACTING USES

Excavation and Earth Hauling.

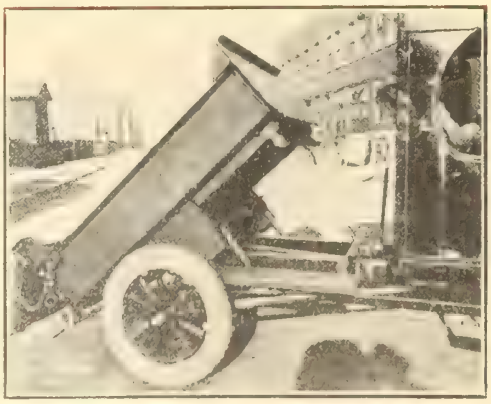
Sand and Gravel Hauling.

Road Construction.

Asphalt.

GENERAL USES

Lumber, and Supplies, Camp Equipment, Coal and General Merchandise.



SPECIAL FEATURES

Controlled from Driver's Seat.

Double Acting Tailgate.

Dumping Angle 45.

Capacity 1-5 cubic yards.

Thickness of metal No. 10 Gauge, 3/16".

Mounted on Chassis with U Bolts.

Dominion Truck Equipment Co., Ltd.

KITCHENER *Manufacturers* TRAILERS, HOISTS, DUMP BODIES, TRUCK UNITS **ONTARIO**

Gunite Protects Steel Penstocks

During the first three years of operation of No. 1 development at Shawinigan Falls power plant, considerable trouble was caused by the accumulation of frazil in the penstocks.

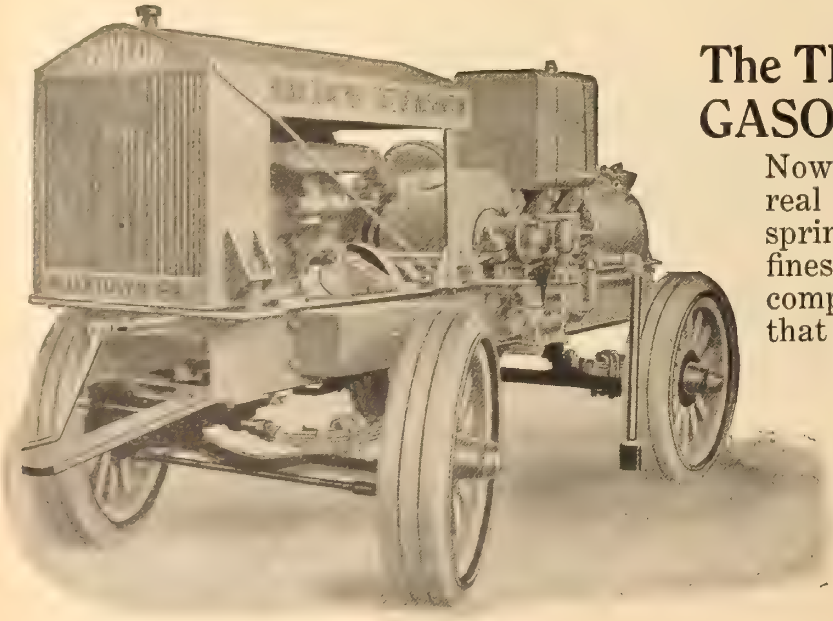
When No. 2 development was undertaken in 1910, it was decided to make a permanent penstock covering that would prevent loss of heat and the consequent formation of ice on the penstock shell. An economical covering was devised consisting of a shell of cement mortar 2 in. in thickness, supported on a steel framework. The "cement-gun and gunite" method was employed.

The success of the operation is best summed up in the words of J. A. McCrory, Shawinigan Engineering Co., Ltd. "This work has been in service for more than 10 years during which time no repairs have been made to the covering."

CEMENT-GUN COMPANY INC. Allentown, Pa.

New York, Chicago, Pittsburgh, Los Angeles, Laredo, Texas, Seattle.
Agents in Eastern Canada: General Supply Company of Canada, 356 Sparks St., Ottawa.
Foreign Agency: International Cement-Gun Company, Zeist, Holland.

"All Cement-Guns sold in Canada are manufactured in Canada."



The TRAYLOR PORTABLE GASOLINE COMPRESSOR

Now the Traylor is equipped with real auto-wheels, rubber tires, big springs and substantial axles—the finest mounting ever put under a compressor. It completes an outfit that has no rival in the portable compressor field.

Get full details of this famous slow speed, powerful, vibrationless compressor with worm gears. Equipped with pump for supplying water under pressure.

CRUSHED STONE

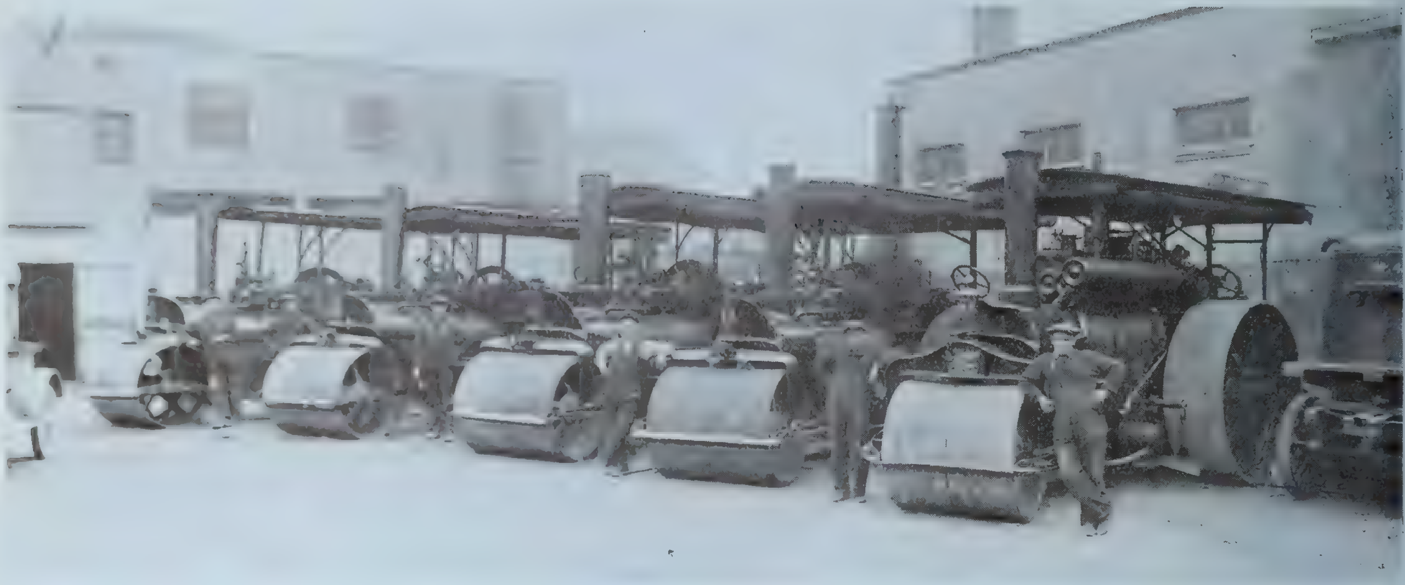
from
the
HAGERSVILLE
QUARRIES

Any size from DUST TO RUBBLE

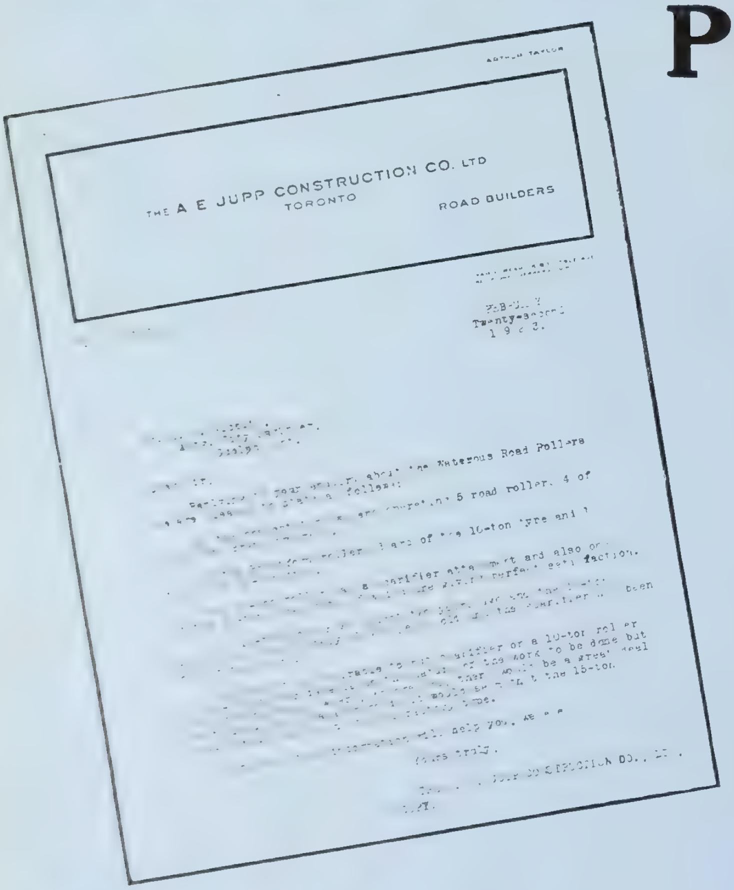
Hagersville Quarries Ltd.

General Sales Agents—Gordon & Armstrong
18 Toronto Street, Toronto, Ont.

Quarries, Hagersville, Ont.
Head Office, St. Thomas, Ont.



"Perfect Satisfaction" Says a Prominent Road Contractor



THE A E JUPP CONSTRUCTION CO. LTD
TORONTO
ROAD BUILDERS

The accompanying letter from the A. E. Jupp Construction Co. Ltd., of Toronto, indicates the many years of satisfactory service that the Waterous Road Rollers, with Scarifier attachment, are capable of giving.

With the Waterous Scarifiers the hardest macadam roads are scarified to a depth of 7 inches and a width of approximately 6 feet at regular travelling speed.

Only one man is required to operate both scarifier and roller. A lever placed conveniently to the operator's right hand raises or lowers the scarifier as desired. They are always ready for use being permanently attached to the roller.

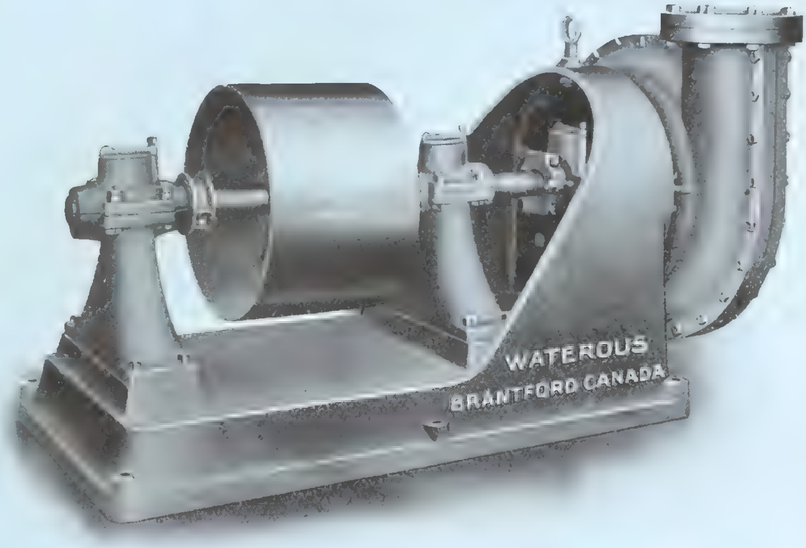
These facts must recommend the Waterous Road Roller and Scarifier to every progressive contractor. Let us send you prices.

Waterous

BRANTFORD, ONTARIO, CANADA

Contractors' Equipment

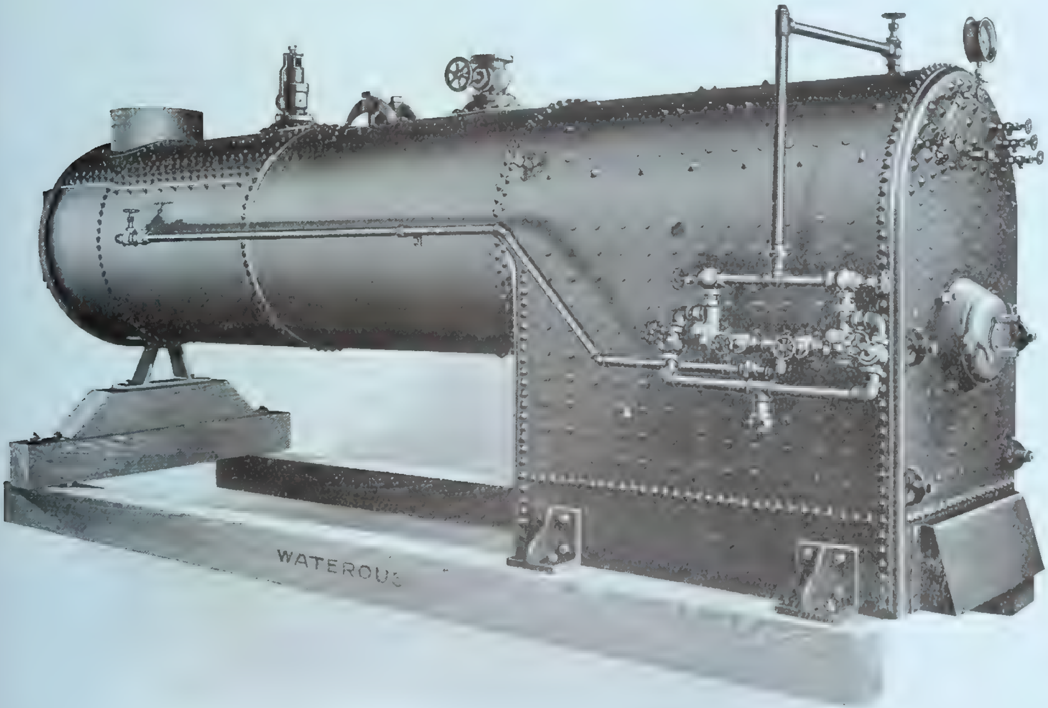
Centrifugal Pumps



Especially adapted to contractors' use. Made in all sizes from 4 to 14 inches. Either belt, engine or motor driven. These pumps are constructed to handle satisfactorily gritty materials and heavy liquids. They will give 24 hour service with practically no attention.

Prices and other details gladly furnished.

LOCOMOTIVE BOILERS



Contractors' requirements can be filled promptly, because we carry these boilers in standard sizes in stock ready for immediate shipment.

You get service in delivery, while Waterous boilers have for years enjoyed a reputation for efficiency in operation.

In design, materials and workmanship they are absolutely to be relied upon and invariably give many years' service.

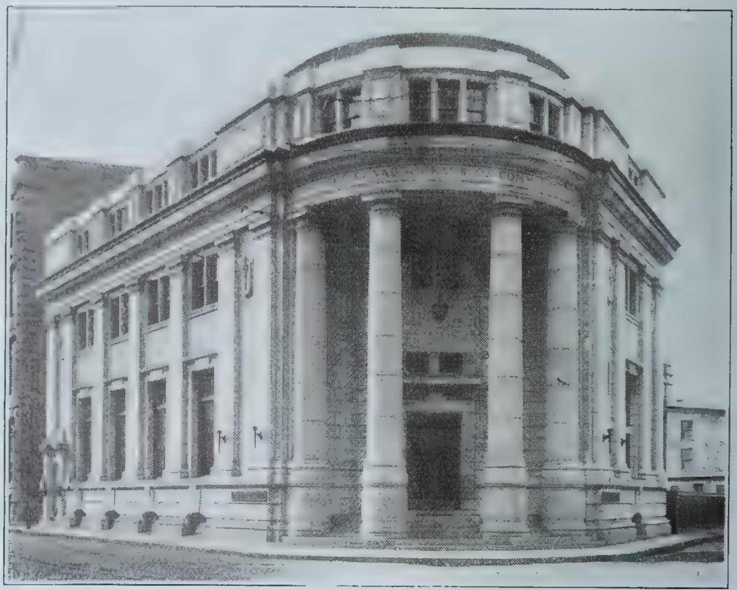
Quick, steady steamers, easily transported and and easy to keep clean. Every one built to provincial regulations and under government supervision. They are, in fact, built better than the law demands.

Full particulars gladly forwarded upon request.

Waterous

BRANTFORD, ONTARIO, CANADA

Deschambault Limestone



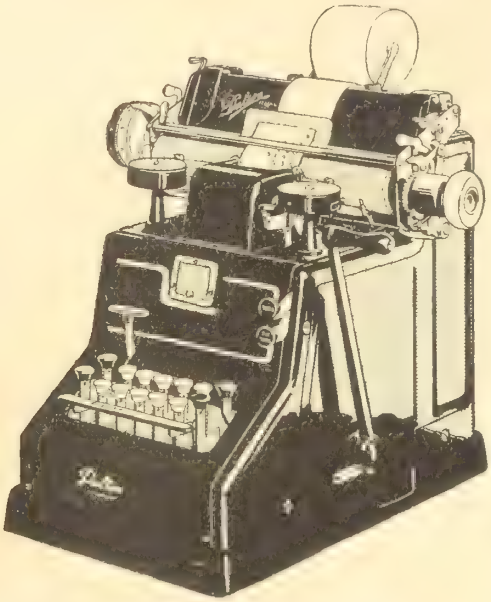
"A credit to Deschambault Limestone"
Canadian Bank of Cemmerce, Quebec, P.Q.

EXCELLENCE in the finished product which arrests attention. That is the quality of Deschambault Limestone.

That is why it is found in so many attractive buildings conspicuous by their solid construction and dignified appearance.

Specify Deschambault Limestone, the material which points the way to better buildings—and satisfied clients.

DESCHAMBAULT QUARRY CORPORATION
Head Office: QUEBEC, P.O. Works: ST. MARC, Portneuf, Co.



WHY use an "adding machine" when you can get this figuring-machine? The Dalton will do ***all*** your figure work—no other adding or calculating machine is needed.

ADDING constitutes the greater part of the figure work of an office, so the Dalton is the world's fastest adding-listing machine. ¶ But the Dalton will do all your figure work—it multiplies (or divides) as easily as it adds, it multiplies whole numbers by fractions, and fractions by fractions; figures costs, profit, wages; makes inventory extensions; pro-rates; figures discounts and percentages; extends and checks invoices—

ALL in shorter time and with less labor than has ever before been possible. ¶ The Dalton gives a super calculating service. ¶ It subtracts at the touch of a key—no laborious mental work involved. With everything involving subtraction—balancing accounts, cross-footing, double column work, etc., the Dalton makes it as easy and simple as addition or multiplication.

THE Dalton does everything that can be done with figures—and it gives a printed proof of every operation. ¶ Further, it does all the necessary things mentioned above, with ***ten keys.***

We have interesting illustrated folders about the Dalton —and you ought to have the information they contain.

Dalton

DIVISION OF
UNITED TYPEWRITER COMPANY LIMITED
135 VICTORIA STREET, TORONTO

THE BULL-DOG

Modern Money Saving Simple Device

BULL DOG FLOOR CLIPS make it possible to secure the many important advantages of wood floors in reinforced concrete buildings at an economical cost, at a vital saving in time, and with a reduction of 18,000 lbs. dead load per 1,000 square feet. Better still, they assure a floor of lasting satisfaction. Concrete floor slabs are poured as in all concrete work, with screeds placed every 8 or 10 feet so that as the concrete is poured it can be leveled off with a straight-edge. With **Bull Dog Floor Clips,** no expensive fill, no cutting down high spots, and no delays, will be necessary. The simplicity of the six steps in installation is best demonstrated by the series of detail photographs below.

PLACING CLIPS.—Within about 30 minutes after the concrete floor slab has been poured and leveled, the plank-guide is placed on the slab, and while the concrete is still green and soft, the clips are pushed into place, so that they embed with the flat top flush in the concrete, accurately spaced and in alignment. After the guide is made as described, no further measuring is necessary. The concrete worker is then entirely finished with his part of the job.

RAISING TABS.—After the concrete slab has hardened it can be used freely for walking, wheeling, or storage, as the flat tops of the clips offer no obstruction. When the job is ready for the wood floors to be laid, a workman goes along with a chisel, or a claw hammer, inserts the edge under the tabs and with a flip of the hand raises them perpendicularly. The solid one-piece clip of No. 20 gauge metal assures rigidity and ample strength.

PLACING STRIPS.—Nailing strips, measuring 1 13/16"x1⅝", the standard dressing of regular 2"x2" strips, are then placed along the rows of clips where they are held snugly between the raised tabs. Perfect alignment and spacing, 16" on centers in both directions, has been secured by the use of the plank-guides. The simplicity of placing strips with Bull Dog Floor Clips saves about 50% over the old fill-method and assures greater accuracy.

LEVELING-UP.—The level slab obtained by placing screeds before pouring, and the embedding of the clips so their tops are flush with the slab surface, assure an almost faultless base. Some leveling up across the nailing strips will be necessary, after which the strips are solidly nailed through the nail holes punched in each tab. Joints come within the clips. The firm anchorage to the slab obtained prevents buckling or doming, and eliminates squeaking when the floor is walked upon.

SLUSHING-IN.—This, and the preceding step of leveling up, are in reality one operation. After the strips are leveled and nailed there may be a few low spots under the strips. Drive a wedge under the strip at the side of floor clip and then slush full with thin cement mortar to assure an absolutely firm and solid bearing. There will be no high spots to cut down. Having the workmen walk on the planks of the guide has also eliminated foot prints and many other irregularities.

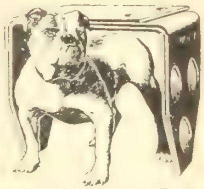
LAYING WOOD FLOOR.—After the sleepers have been securely fastened as just described, the wood finish floor, or the rough flooring if specified, is laid in the usual manner. No fill is required to hold the strips. Carpenters place the strips and lay the finish floor at the same time. There is no delay when time is precious waiting for a cement fill to dry out. The dead air space assists in sound deadening and prevents deterioration by dry rot of the sleepers and finished floor.

THE WESTERN STEEL PRODUCTS LTD.

Branches REGINA SASKATOON CALGARY EDMONTON

FLOOR CLIP

For Laying Wood Floors Over Concrete



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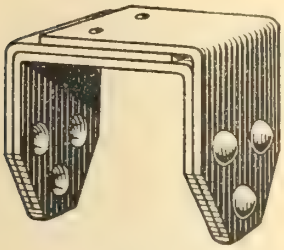
ARCHITECTS & CONTRACTORS who have used BULL DOG FLOOR CLIPS say the BULL DOG METHOD is the best ever devised to hold a wood floor to concrete.



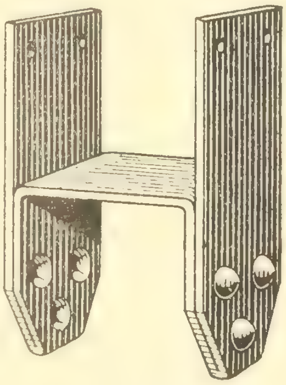
Canadian Pat. No. 216554
March 7, 1922

Bull Dog Floor Clip as manufactured and placed in soft concrete, which allows free use of floor.

NO CONCRETE FILL REQUIRED: USE 2 x 2 unbevelled instead of 2 x 3 bevelled sleepers.

ACTUAL MONEY SAVED by eliminating a concrete fill and by using 2 x 2 unbevelled sleepers amounts to over 4c. a square foot of floor area; and over 3c. against a cinder concrete fill.

REDUCE DEAD LOAD:—Approximately 18,000 lbs. per 1,000 square feet by eliminating concrete fill; Great Saving in re-inforcing steel is effected.



Canadian Pat. No. 216554
March 7, 1922

Bull Dog Floor Clip showing top members raised to receive floor strips.

SPEED UP BUILDING:—Unobstructed use of floor slab until you are ready to lay wood floor. Sleepers and finished floor can be laid at one time, thereby preventing costly delays waiting for fill material to dry out.

THE BULL DOG FLOOR CLIP is made of 20 Gauge KEYSTONE GALVANIZED COPPER-STEEL. They hold the sleepers so rigidly to the floor slab that buckling or squeaking of finished floor is impossible; neither will the finished floor dome up from moisture, which is often the case when a concrete fill is used.

ARCHITECTS:—By adopting The Bull Dog Method you eliminate all possibilities of hit or miss construction.

DRY ROT, which usually attacks a poor grade concrete or cinder-concrete fill and is in turn transmitted to the sleepers and finished floor, naturally will not take place; a slight circulation of air under the finished floor keeps it and the sleepers in perfect condition.

CONDUITS AND PIPES can be placed on top of the slab, right under the finished floor; are easy to get at; and are practically free from corrosion, whereas concrete fill corrodes them very quickly.

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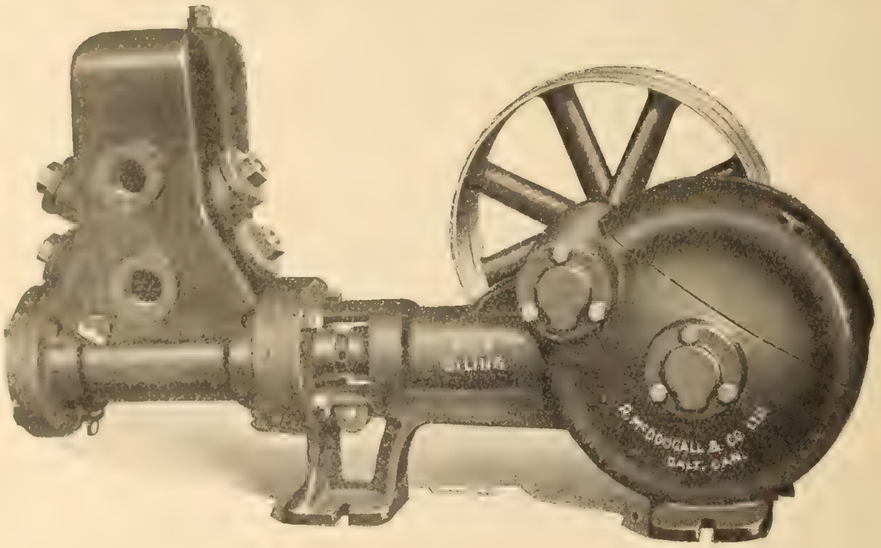

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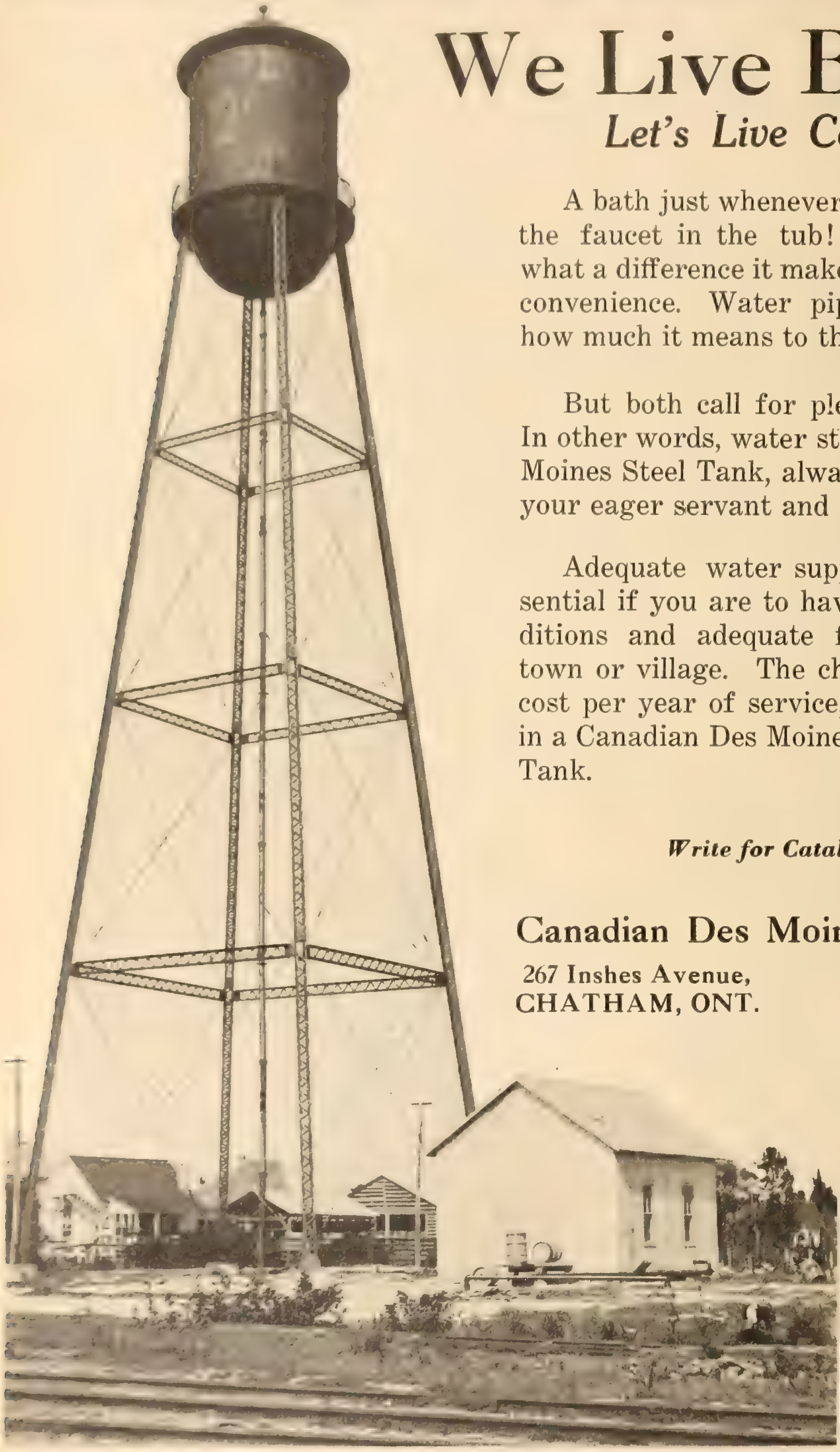

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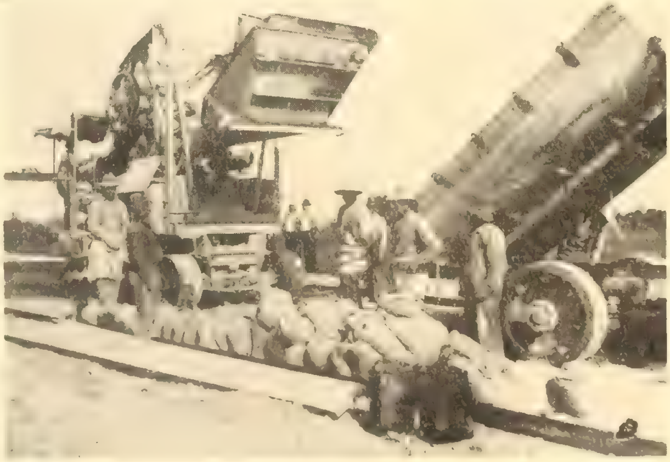

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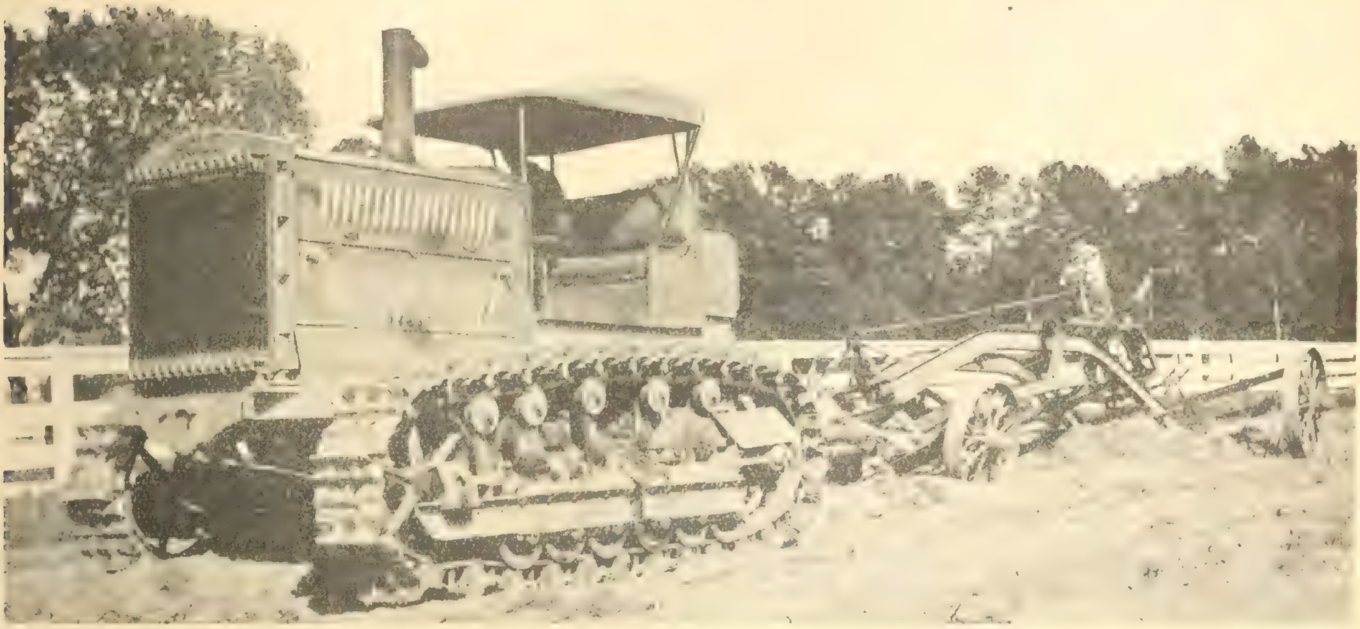

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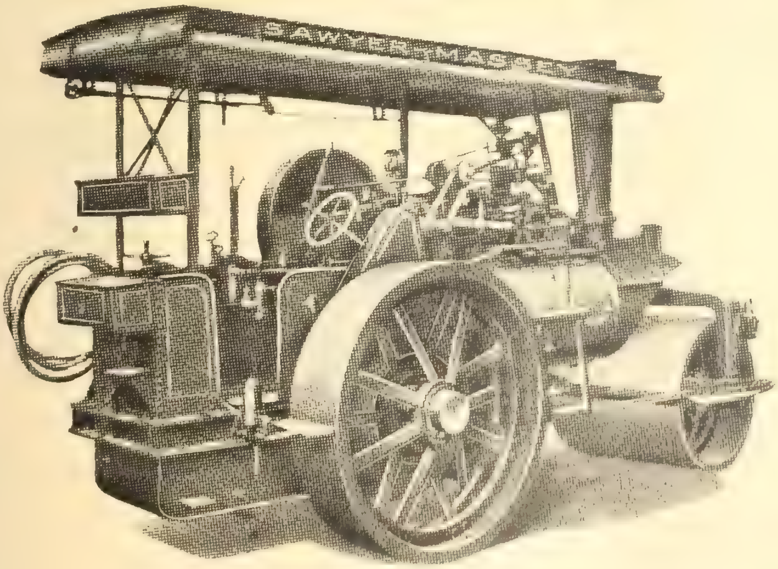

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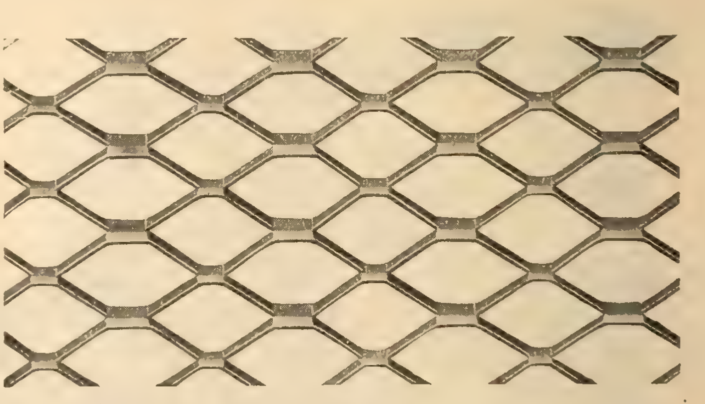

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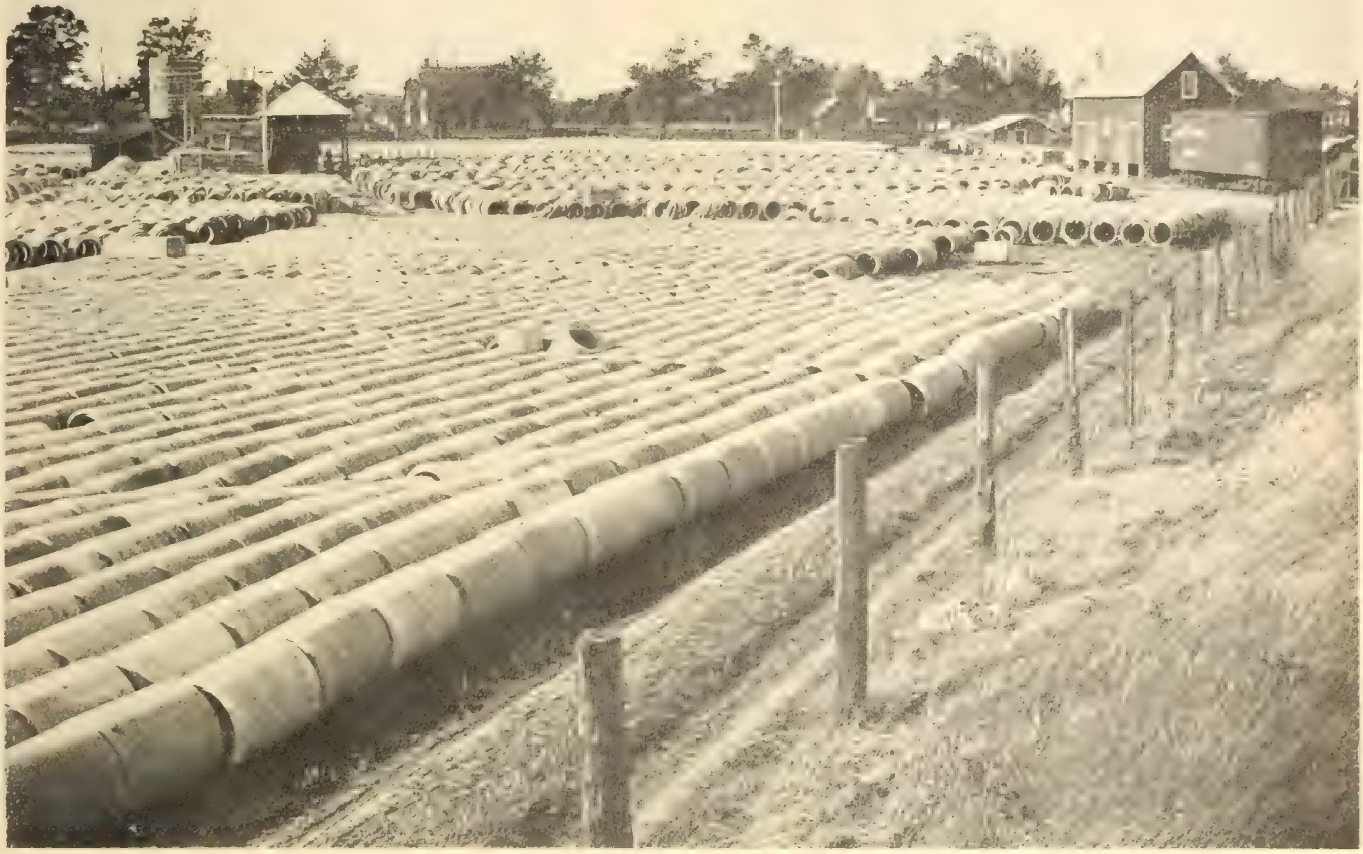

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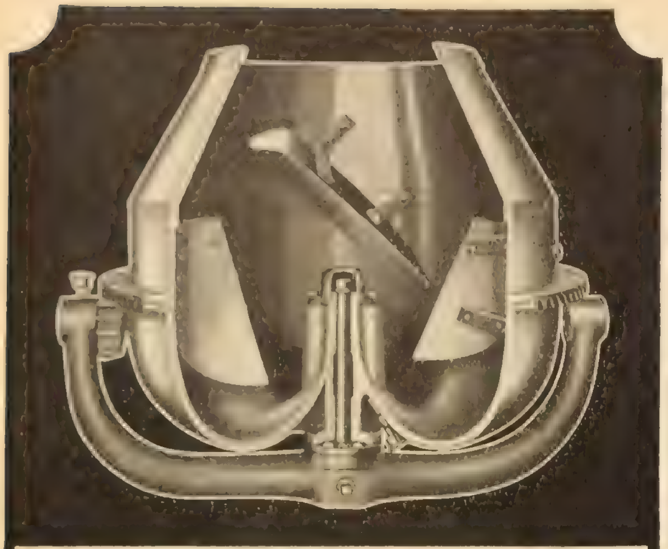

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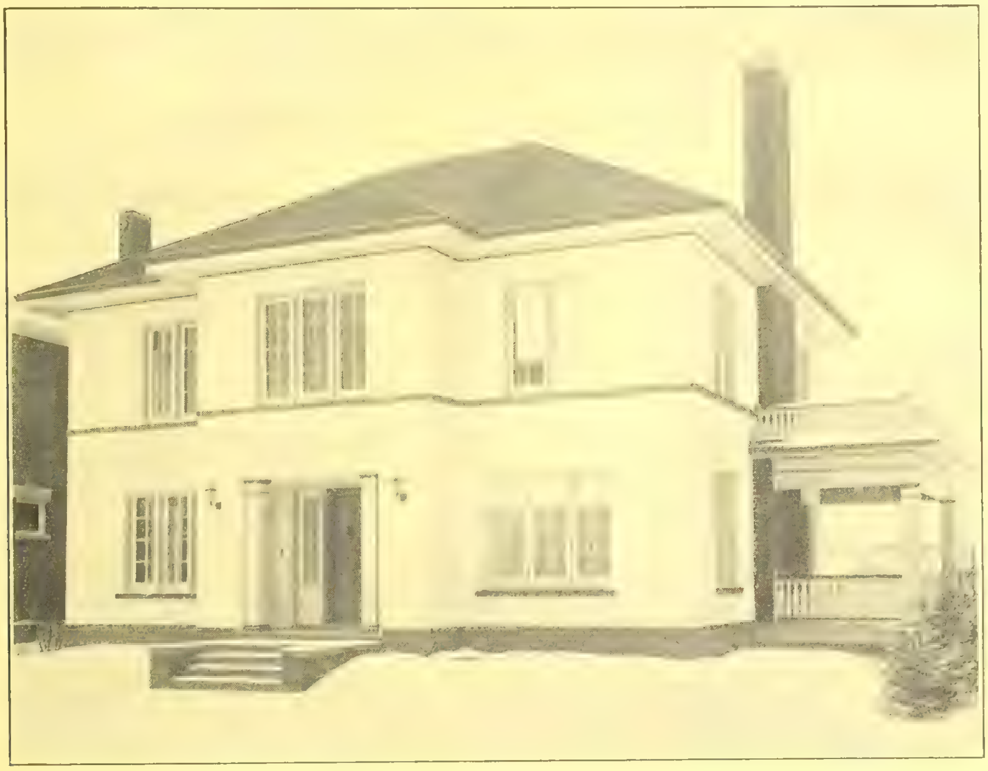

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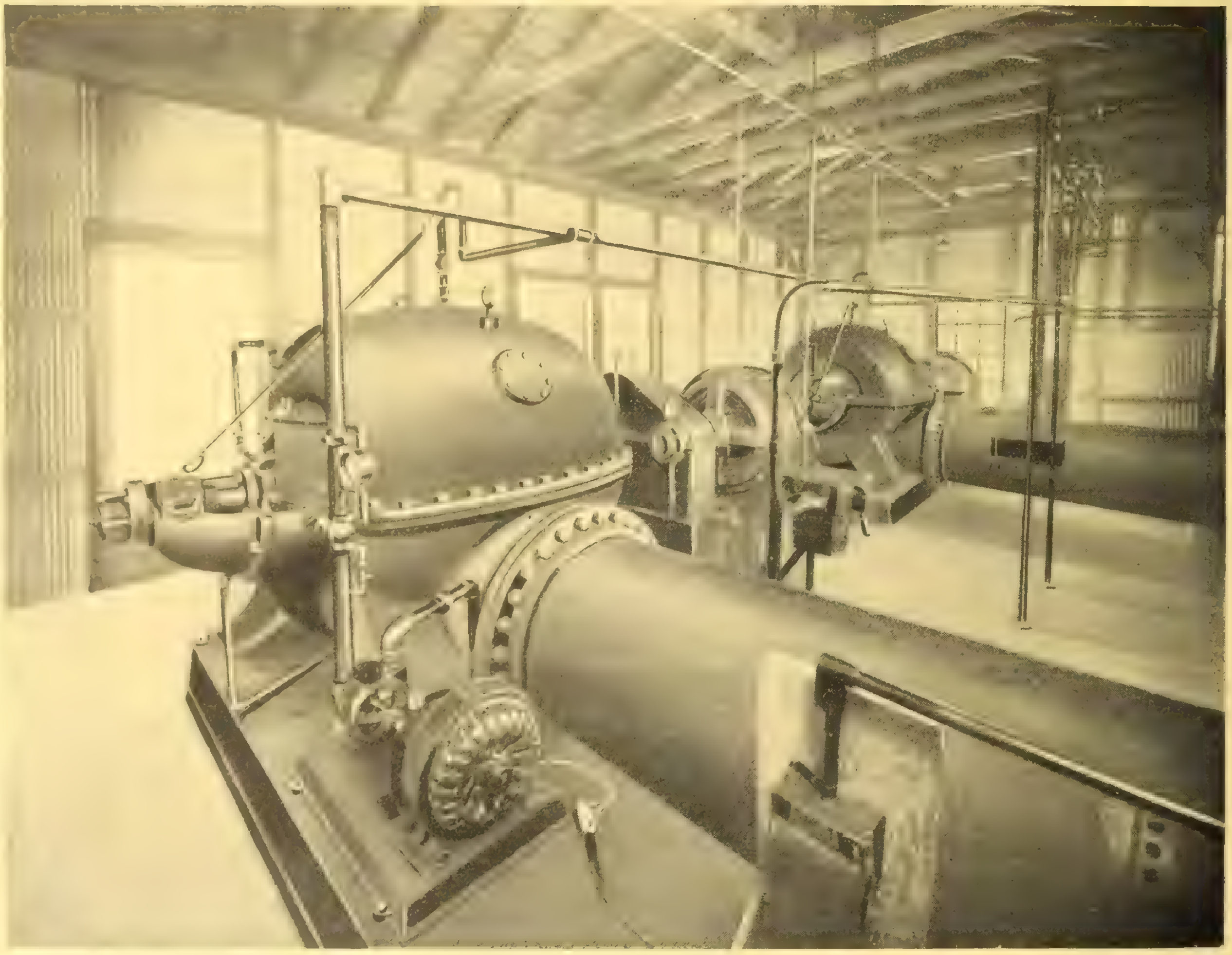

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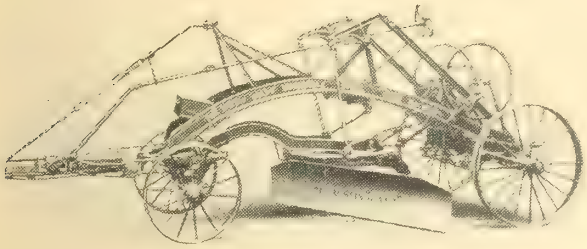

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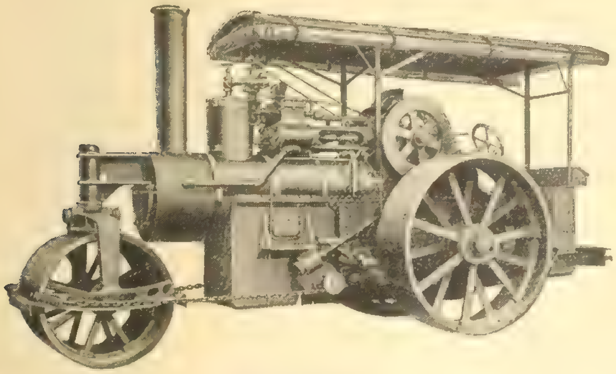

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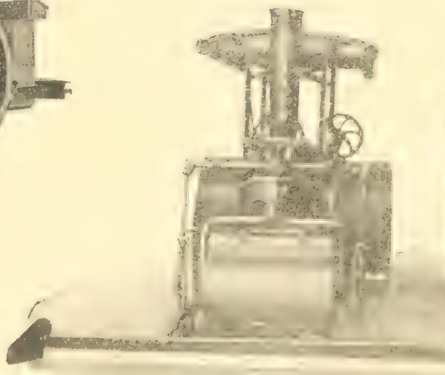

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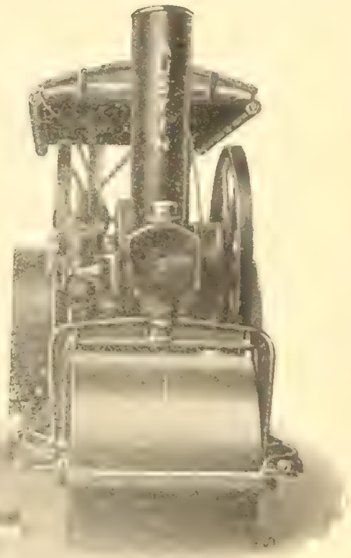

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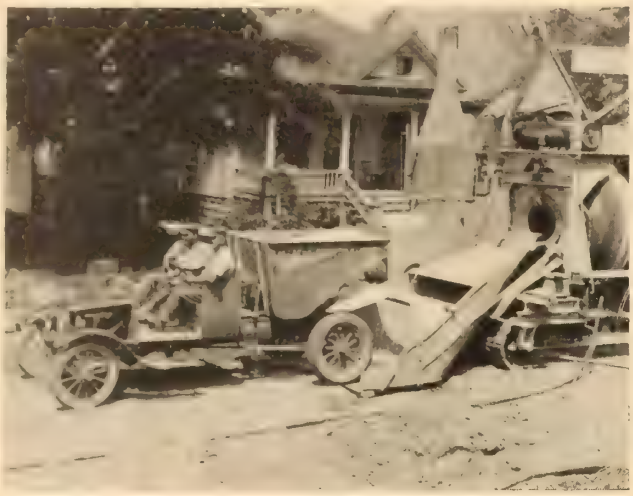

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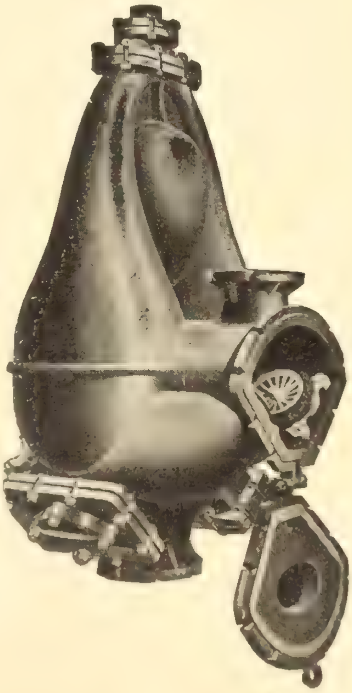

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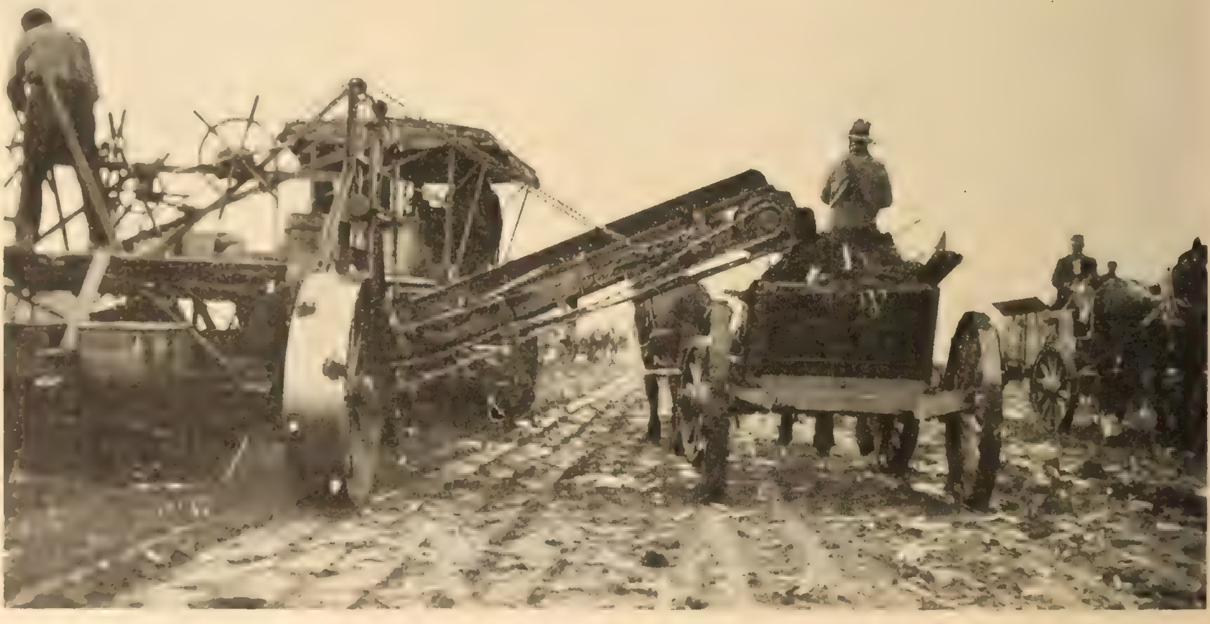
1923 Model—Western Elevating Grader



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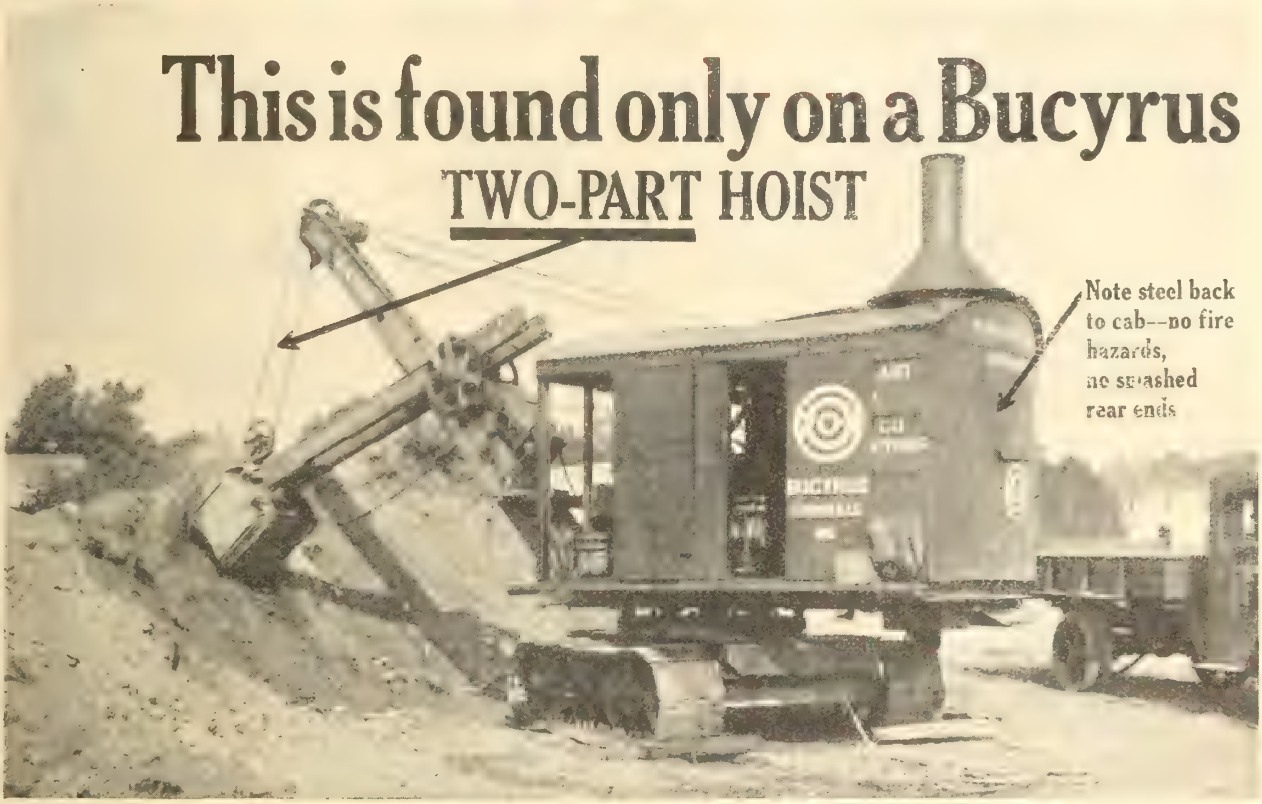

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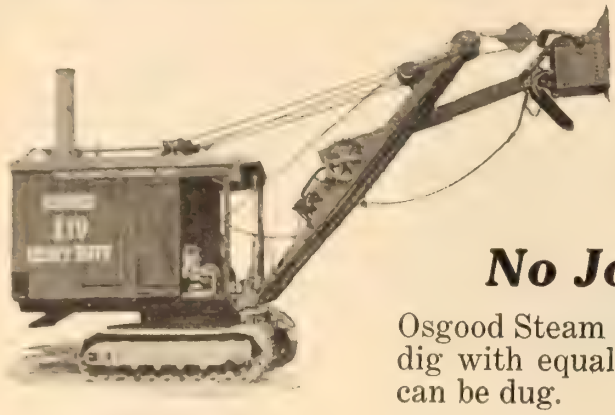

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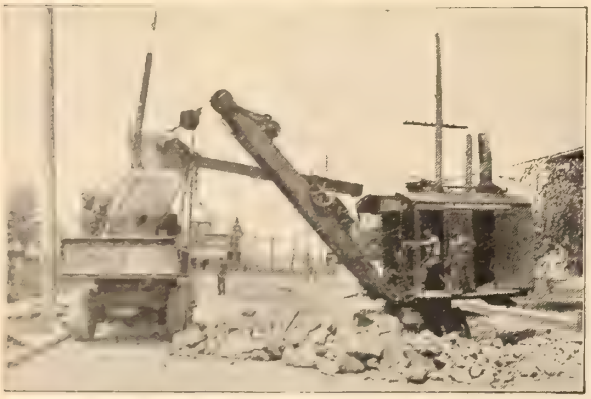

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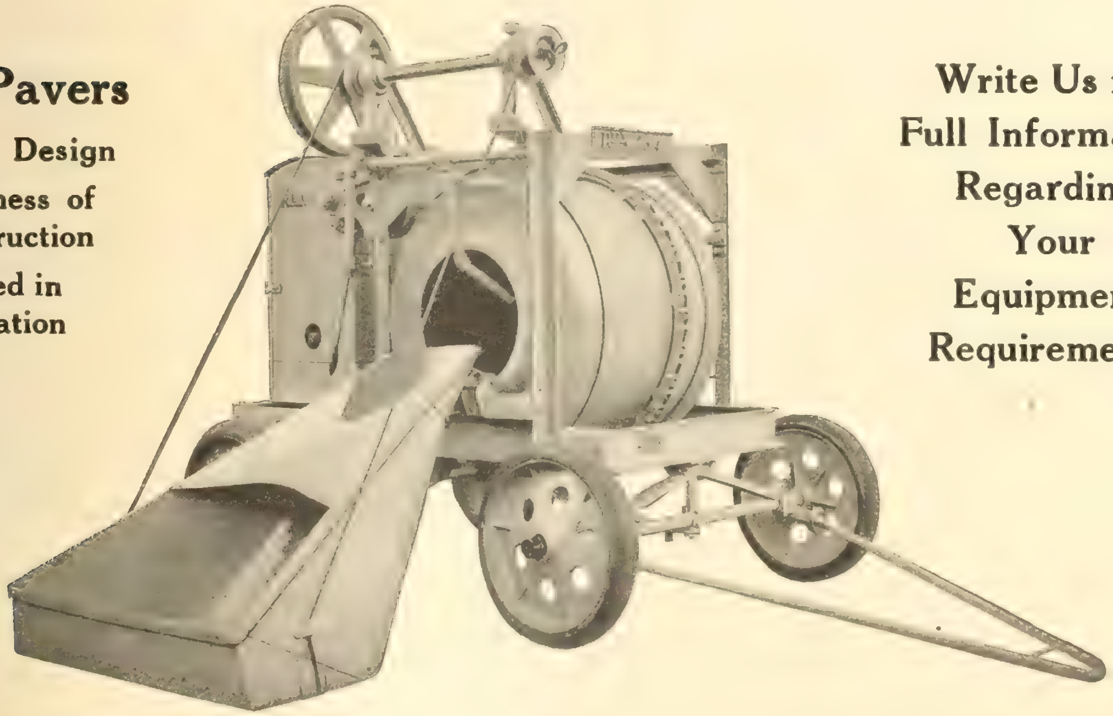

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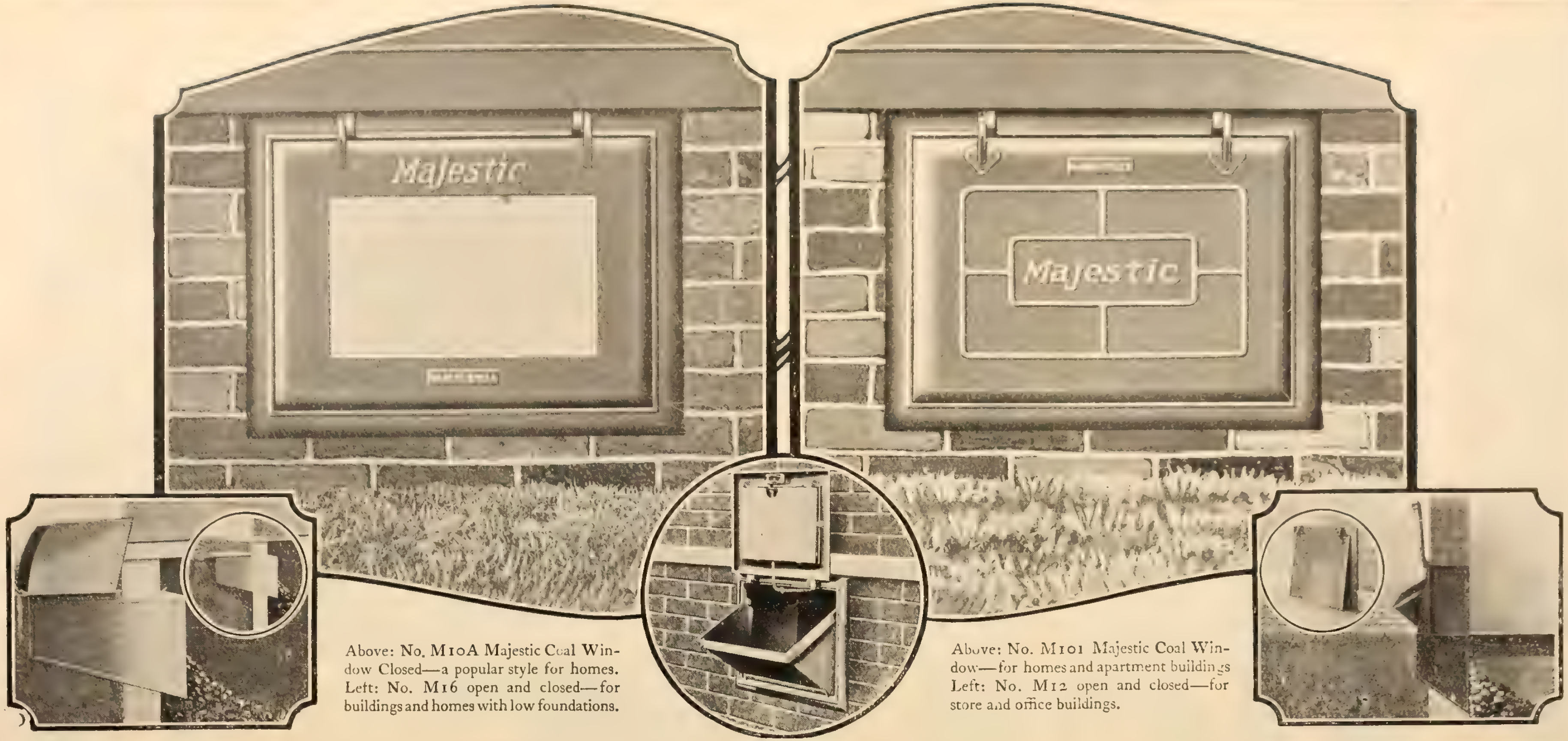

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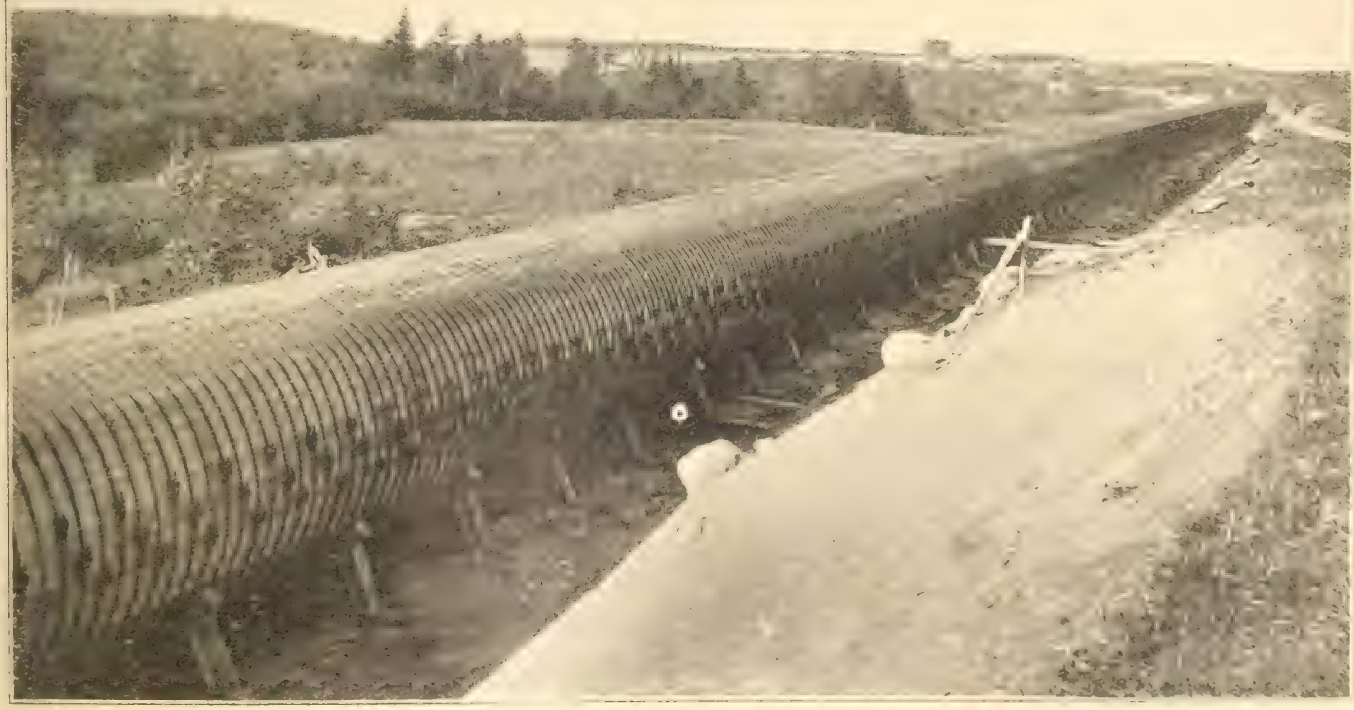

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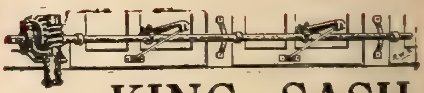

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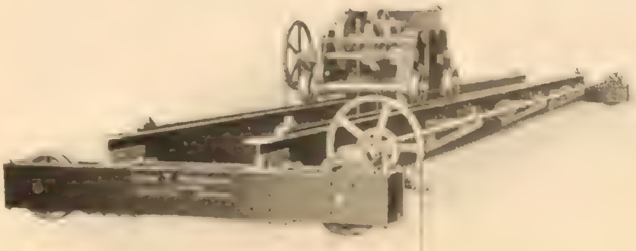

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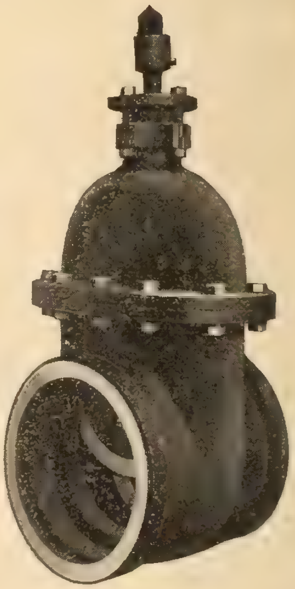

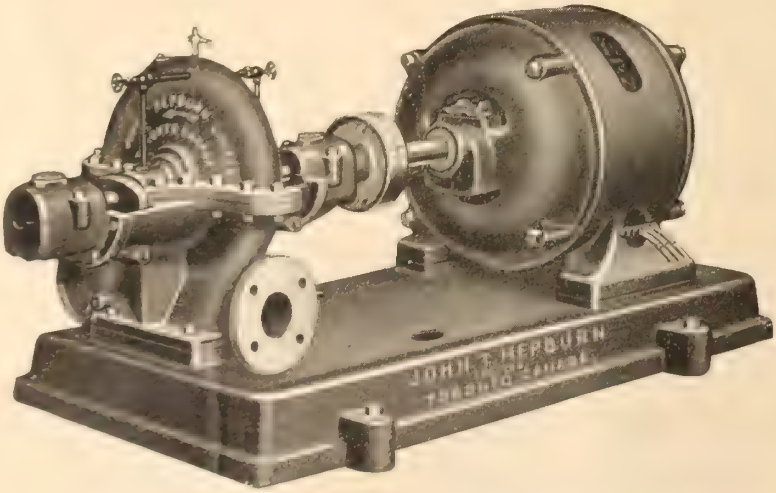

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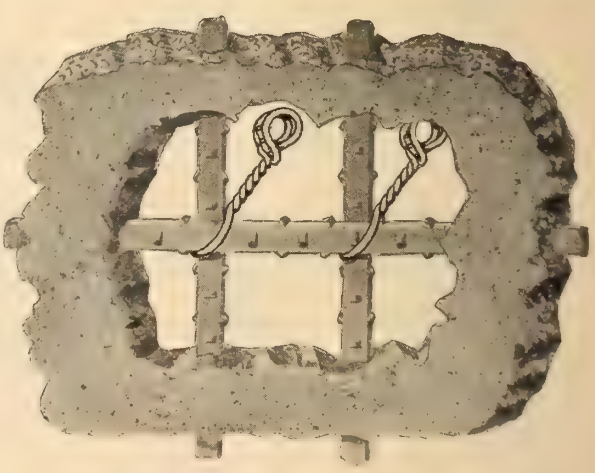

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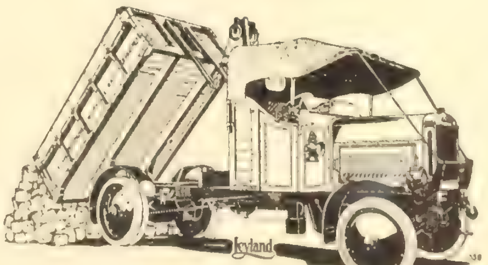

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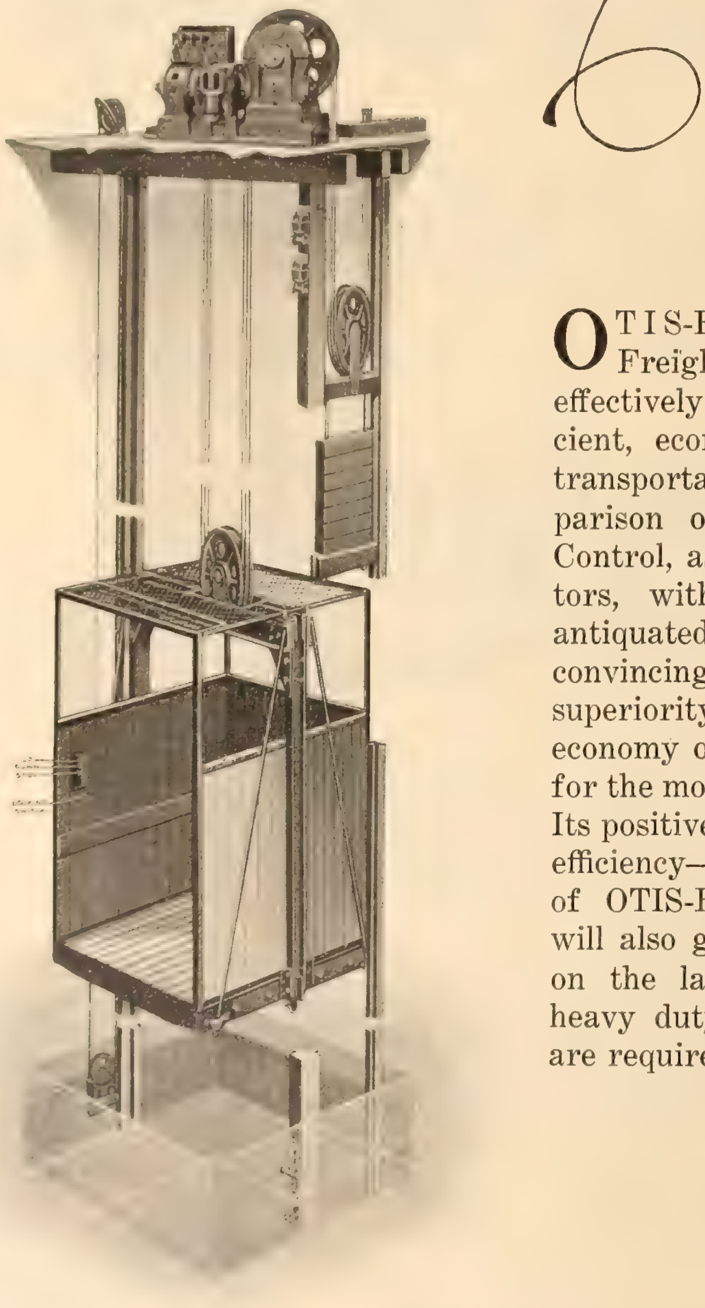

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Canada's Building Industry is Sound and Progressive. Optimism is Fully Justified

Forecasts, based on sound analyses, are especially useful in the building and construction industry. It is essential that the architect, contractor, supply house and manufacturer should be able to see a few months in advance so that he can gauge the demands likely to be made upon his organization. The Annual Number of the Contract Record is designed to perform this office, so far as is humanly possible, for the building and construction industry. It does not claim to say what is the total of the work to be performed during the whole year. What it offers, however, is a summary of the contracts already determined, with such advance information on contracts pending as can be safely given out at this date. Our total of expenditures for the year, so far as can be determined, amounts to the magnificent sum of two hundred and seventy-one million dollars. We must leave it to our readers to supply the figure by which this may be multiplied to cover the whole year; it may be two, or even three. Even if the work already decided upon is only doubled during the remainder of the year, we shall be much ahead of last year. Present prospects all seem to point in that direction.

While some of the items listed may be considered as reasonably complete, such as Dominion, provincial and municipal appropriations, no such claim can be made for private capital expenditures. It will be noted also that we have only included the larger municipalities, as space would not permit anything more. In the matter of private houses, churches, office buildings, factories, industrial plants, etc., our present figures probably do not represent more than one-third of the final total. Nor have we been able to gauge with any accuracy the expenditure of our two great railways and some big building work has been talked about for our National System.

* * *

The industry can get another viewpoint of the situation from the fact that the total contracts awarded for all Canada up to the first of May is twenty per cent greater than for the same period last year. In this connection we must also consider the lateness of the season and the unseasonable weather which has delayed work to a great extent.

We hope the figures we have been able to present in the following pages and articles and descriptions of a general character that are also given in this issue will be found both interesting and valuable to our readers. The opinions offered by a number of our best engineers on the subject of engineers entering public life undoubtedly touch the profession closely. Professor C. R. Young has a splendid article on "The Trend in Bridge Design" as also has Dr. Nasmith on the general subject of "Sewage Disposal," both of which will be inestimable as records. The coal situation is authoritatively treated by Mr. G. R. Pratt, coal engineer to the Alberta Government. Mr. Horner and Mr. Carswell add intelligent contributions to the important question of proper co-operation between the architect, contractor and the public. The big subject of roads is handled by Mr. A. W. Campbell. The issue also contains a report of the

Windsor Waterworks Convention with papers and discussions, including a valuable contribution by Mr. Wm. D. Hatfield, on "Water Purification by Sand Filtration." Finally, we give illustrations and details of some of the most outstanding pieces of Canadian construction work bridges, churches, car barns apartment houses, department stores, schools.

We are 'making haste slowly' but we are moving in the right direction. Perseverance, continuity, caution, seem to be good watchwords.

We Must Have More Skilled Workmen

As the season advances, it is becoming clearer every day that the anticipation of shortage of skilled workers has not been exaggerated. The trouble is being accentuated by the expansion of business in Canada and by the emigration of skilled workmen to the United States where the demand has been abnormal and where the wage paid is much in excess, in a number of cases, of the standard wage in Canada. Either building must be curtailed, or the number of skilled workmen must be increased. The latter seems the proper alternative.

Not long ago we drew attention to this matter in the Contract Record by printing a letter from J. M. Pigott, President of the Association of Canadian Building & Construction Industries. At that time we pointed out the urgency of the situation and hoped that something may be done. However, the fact is that the skilled labor Unions are jealous of any increase in numbers, fearing that the demand might not equal the supply, with the result that wages may decline. It is an entirely selfish viewpoint for which however they cannot be altogether blamed, in that they are following pretty well the course that other bodies of men grouped together for self interest have followed in the past. By this we mean they are not establishing a precedent, but are merely following the precedent that is as old as the world itself. On the other hand, the fact that this condition has existed for centuries, does not make it any easier for the general public to bear. The present situation in the building industry, which is very largely the result of shortage of skilled labor, is making life for the general public very materially harder; it is curtailing general industrial activities and in the last analysis is reacting, we believe, and will continue to react, on the members of the labor unions themselves.

Everybody Wants Good Roads—Attend the Convention in Hamilton

The following is the program of the tenth annual convention of the Canadian Good Roads Association, which will be held on June 11-14 in Hamilton, Ont.

Monday, June 11th, 1923

9.30 a.m.—Registration of delegates and visitors at convention headquarters, registration continuing throughout the convention.

2.00 p.m.—Automobile drive over the provincial highways covering a distance of approximately sixty miles.

Tuesday, June 12

10.00 a.m.—Presiding Officer, Hon. J. L. Perron, K.C.

"Provincial Systems of Highways and permanent Construction," by Geo. Hogarth, chief engineer, Province of Ontario. Discussion by H. M. Necker, chief engineer, Province of Quebec.

"Test Road Experiments," by Thos. H. McDonald, Chief, United States Bureau of Public Roads, Washington, D.C. Discussion by Clifford Older, state highway engineer, Springfield, Ill.

2.30 p.m.—Presiding officer, Hon. F. C. Biggs.

"Who Should Pay for the Road," by A. W. Campbell, 1st Commissioner of Highways, Dominion Government, Ottawa. Discussion by H. S. Carpenter, Deputy Minister of Highways, Province of Saskatchewan.

"Maintenance," by E. A. James, consulting engineer, Toronto. Discussion by B. M. Hill, chief provincial highway engineer Province of New Brunswick.

"Patrol Systems, how best conducted." Discussion by A. McGillivray, chairman, Good Roads Board, Province of Manitoba.

Wednesday, June 13th

10.00 a.m.—Presiding Officer: Hon. Dr. Sutherland.

"Methods of Reconstructing Old Macadam Roads," by James Pearson, president, The Constructing & Paving Co., Toronto. Discussion by A. P. Sandles, Columbus, Ohio.

"Culverts and Small Bridges," by J. L. G. Stuart, Oshawa, Ont. Discussion by R. Jackson, Guelph, Ont.

"Refined Tar in Construction and Maintenance," by J. S. Crandell, Consulting Engineer, New York City. Discussion by A. F. Macallum, Commissioner of Works, Ottawa, Ont.

2.30 p.m.—Presiding Officer: Hon. C. W. Chisholm.

"Cement Concrete (Single track)," by A. M. Jackson, County Engineer, Brant, Ont. Discussion by J. D. Wilson, Halton Co. Road Superintendent, Burlington, Ont.

"Road Machinery," by J. Lefebvre Boulanger, Deputy Minister of Roads, Province of Quebec. Discussion by Patrick Phillip, Public Works Engineer, Province of British Columbia.

4.30 p.m.—Annual General Meeting, Canadian Good Roads Association: Reception of Annual Report and Financial Statement, Auditor's Report, and election of Directors and Officers for the ensuing year.

5.30 p.m.—Meeting of newly elected Board of Directors, for appointment of committees, etc.

7.00 p.m.—10th annual dinner & entertainment, Royal Connaught Hotel.

Thursday, June 14th

10.00 a.m.—Presiding Officer: Hon. J. G. Gardiner.

"The Proper Use of the Highway"

(a) Methods for regulation of traffic and enforcing laws.

(b) The Autobus.

(c) Motor Truck.

(d) Uniform hand and danger signals.

(e) Headlight regulations.

(f) Lights on all vehicles.

"Tourist Traffic," by John Pierce, passenger traffic manager, Canada Steamship Lines, Montreal. Discussion by J. B. Harkin, Commissioner Canadian National Parks, Ottawa.

"The Contractor," by Col. W. G. MacKendrick, Toronto. Discussion by A. E. Foreman, Vancouver, B.C.

How High Will it Reach?

Canada's Building and Construction Program for the Year 1923

In the Following Pages We are Able to Give an Inspiring, Though Necessarily Incomplete, Forecast of a Steadily Growing Activity in Practically Every Province in the Dominion—Looks Like Fifty Percent Better Total than Last Year—House Demand Seems to Continue

It ought to be possible by the last week in May, to be able to say fairly definitely what work will be undertaken during the year, for if it were possible to look ahead so far as to lay our plans out for the season's work during the first four months of the year, it would undoubtedly effect a very considerable saving in the cost of every kind of construction work. At the same time, it would relieve the minds of the architects, contractors and suppliers of all kinds of material, as well as labor itself, of a very considerable amount of what, theoretically at least, seems unnecessary worry. This is an ideal to look forward to, however, rather than back upon, and the best we can do in the way of outlining the year's work must fall very short of the correct total for, doubtless, as in the past, much new work will continue to be projected through the remaining months of the year.

However, it is entirely surprising what a large quantity of construction is already either in progress or in immediate prospect and in the following pages we have attempted to give a general idea of the activities in the building and construction field at various points in Canada. What percentage our summary may be of the total work eventually undertaken, it is impossible to estimate. The final total may be anywhere from two to three times the amount that we have indicated, but our figures will at least serve the useful purpose of showing the building industry in Canada, the United States and elsewhere that we have "Big" things in prospect—as becomes a big country, with wonderful natural resources.

We believe the summary we have been able to make will prove an inspiration to every Canadian associated in any way with the building and construction industry.

Dominion Government Expenditures

The Dominion Government, to begin with, has a number of very important undertakings under way, some of which are new, but most of which are merely continuations of undertakings of previous years. For example, the Ottawa Parliament Buildings call for an added expenditure of $700,000. Then there is an addition to the Dominion Archives Building $150,000; a new building for the Printing Bureau $150,000, this makes a total expenditure on buildings in Ottawa of $1,000,000 to be charged to Capital Account.

Harbors and Rivers

Under the heading of Harbors and Rivers, there is the Esquimalt Dry Dock in British Columbia, for which $1,500,000 has been appropriated, for work this year; harbor improvements at Port Arthur and Fort William will cost $135,000; the Champlain Dock in Quebec Harbor will cost $96,000 to complete; improvements to St. John Harbor $860,000; improvements to Toronto Harbor $250,000; making a total of $2,841,000 under this heading and a grand total of $3,841,000. This is in addition to the big expenditures which will be made by the Canadian National Railway System, Inter-provincial Good Roads, Welland Canal, etc.

The expenditures chargeable to Income, by the Public Works Department of the Dominion Government amount to the very considerable sum of $10,485,160. This is made up, distributed roughly as follows.

Public Buildnigs

Nova Scotia, $3,600; New Brunswick, $4,000; Maritime Provinces, General $38,000; Quebec $138,000; Ontario $311,750; Manitoba, $49,850; Saskatchewan, $34,200; Alberta, $36,737; British Columbia, $43,982; General, $192,000; Rents, repairs, furniture, heating, etc., $5,135,500.

Harbors and Rivers

Under the heading Harbors and Rivers, the various Provinces will receive attention as follows: Nova Scotia, $293,100 Prince Edward Island, $33,700; New Brunswick, $65,600; Quebec, $572,785; Ontario, $463,530; Manitoba, $41,265; Saskatchewan & Alberta, $21,000; British Columbia, $237,235; Yukon, $5,000; General, $30,000.

Dredging

The expenditures will be as follows:

Maritime Provinces, $600,000; Ontario & Quebec, $625,000; Manitoba, Saskatchewan and Alberta $100,000, British Columbia, $400,000; Total, $1,725,000.

Roads and Bridges

The total appropriation for roads and bridges is $39,050.

Telegraph & Telephone Lines

General repairs and minor purchases under this heading will only amount to $37,125.

Miscellaneous

Under this heading come a variety of items with some of which the contractor is not specally interested, but which include as an example, maintenance and operation of water storage dams on the Ottawa River and its tributaries, certain surveys and inspections and a number of monuments and tablets, to a total of $931,950.

Authorized By Statute

A number of items under this heading total $234,921. They include two dry docks at Collingwood and one at Port Arthur, floating dock at Montreal and a floating dock at Prince Rupert.

Province of British Columbia

J. E. Griffith, the Deputy Minister of Public Works of British Columbia, reports to the Contract Record as follows:

"Our current estimates provide the sum of $2,375,879 for maintenance and repairs but we have other work which will be undertaken, for which funds are being provided out of different Acts. The Minister has not yet decided on his full programme."

As far as roads are concerned, the only contract awarded so far this fiscal year is that of the paving 18 feet wide with one course concrete of the Pacific highway for a distance of about eight and one half miles. With the completion of this work next fall there will be a continuous strip of paving from Vancouver to the United States Boundary near Blain, a distance of approximately thirty miles.

Vancouver

Reports from Vancouver show that construction work is picking up wonderfully on the Coast. For the first four months of the year the building permits issued by the building department of the city aggregated $1,584,216 as compared with $1,267,261 for the same period of last year. MacLean Building Reports' figures, which are very comprehensive, and include other types of construction than building, show that for the first three months constructon valued at $1,249,910 was undertaken while only $902,786 worth went under way during the same period of 1922. The conclusion that can be drawn is that there is a very satisfactory improvement evident and this is borne out by reports from the West which confirm the opinion that conditions are reviving on the Coast.

Figures which have just been received by the Contract Record show that $60,000 is being allotted to sewer work and $800,000 to waterworks in Vancouver. The paving of streets will absorb, it is estimated, $160,000, while the amount for sidewalks has not yet been decided upon. At the present moment these are in immediate prospect office buildings costing $125,000, warehouses costing $40,000. Undoubtedly as the season progresses new projects will loom up, all of which will serve to augment Vanvouver's total and place it well beyond any figure established in the past few years.

Victoria

F. M. Preston, city engineer of Victoria reports in considerable detail regarding the municipal construction undertakings which will come under his jurisdiction during the present season. His estimate of the cost of these is $122,866. By far the largest proportion of this amount will be devoted to roadways—the exact amount is $90,600. The next largest item is waterworks to which $21,866 will be devoted. The other important divisions of municipal work, sewers and sidewalks will involve expenditures of $9,000 and $1,400 respectively.

With regard to building, it is somewhat difficult to prophesy, but the engineer points out that up to date $350,000 worth of building permits have been issued, which is a little higher than last year. Victoria will undoubtedly reap the benefit of the better conditions that now pretain in the coast district and before long there is an expectation of considerable revival in building. Assurances have already given that new projects will come to light very shortly.

Vernon

In the case of Vernon, there will be a fair amount of new work in the municipal field as well as the usual maintenance. The city engineer reports $30,000 of new work in connection with the waterworks and $1,500 worth of new works on streets. The usual maintenance in connection with sewers will be carried out in addition to $9,000 for this phase of waterworks and $1,000 applying to sidewalks.

Building in prospect is rather encouraging for a city of Vernon's size and reports which have come to us indicate that there is somewhere around $115,000 worth of work at least in sight. Of this $50,000 is classed as belonging to office buildings and stores, while $35,000 will be expended on homes. Warehouses, schools and churches together, are expected to absorb $30,000 while other construction work will involve nominal expenditures.

New Westminster

Encouraging reports come from this city, well over a half million dollars worth of work being in sight. Harry Stewardson, the city engineer, estimates that $120,000 will be spent on works coming under his direction. Of these, waterworks will require $80,000, while sewers, sidewalks and streets will cost $40,000.

Of ordinary buildings, Mr. Stewardson estimates that office buildings, warehouses and stores to be erected right away will cost $60,000. Factories and commercial buildings will require an expenditude of $100,000 while $250,000 will be devoted to other types of construction work. The total of building therefore is $410,000.

Province of Alberta

Medicine Hat

This is one of the municipalities in which the prospects for a large volume of work are not very bright. At the present moment very little of a tangible nature can be offered, inasmuch as our reports indicate that only $3,500 for waterworks is assured. This amount is to cover 2,000 feet of 4 in. cast iron pipe.

Edmonton

In Edmonton the municipal work that will probably be undertaken, comprises paving valued at $50,000 and six miles of sidewalk to cost $30,000. Aside from this the municipal government is not anticipating any heavy expenditures.

As far as building work is concerned, the outlook is not exceptionally promising. The Isolation Hospital valued at $150,000 is the only building of any size about which there is any prospect of going ahead. It is possible of course that as the season progresses and crop conditions look assuring, money will loosen up ond other work will develop.

Calgary

The amount of sewers, paving and water supply works which are likely to be carried out in Calgary during the present year is negligible according to the city engineer's report to the Contract Record.

In building, however, there is a somewhat different story. A church at $50,000, a parish hall at $15,000 and a small church at $4,500 are definite projects, while the Imperial Oil refinery and flour mills valued at $2,500,000 and $1,500,000, respectively, bring the total to a large amount. Another factory at $15,000 is under way as well as twenty residences that will cost approximately $100,000.

Lethbridge

$64,000 is the amount that is estimated to cover municipal engineering expenditures in Lethbridge. This is divided as follows: $10,000 for sewers; $4,000 for sidewalks and $50,000 for paving.

The Commissioner of Public Works reports to the Contract Record that the situation in the building field is problematical, but he estimates that the city will do better this year than in either 1921 or 1922.

Province of Saskatchewan

The Legislative Assembly of Saskatchewan voted, at their last session, $1,212,640.00 from Revenue, and $906,000.00 from capital, a total of $2,118,640.00 to be expended upon public improvements, viz., roads, bridges, and ferries, in the season of 1923.

Although the Department of Highways, who are administering this vote, have not completed the details of the programme of works to be undertaken, they have allotted the following sums for the services indicated.—

(1) Provincial Highways, construction and maintenance, $1,110,000. (2) Main Market Roads, construction and improvement, surveying, etc. $663,640. (3) Concrete, steel and timber bridges, construction and re-construction, $230,000. (4) Ferry service, operation and maintenance $115,000. Total $2,118,640.

In connection with the proposed expenditures on provincial highways, it is anticipated that this will be the full extent of the expenditure for the year, and included in this amount is the 40 per cent contribution which the Federal Government will make under the terms of the Canada Highways Act.

Fifteen calls for tenders for projects on the Provincial highways system have been issued, and some of these works are already under way. Seven calls for tenders for the concrete and steel bridges have been issued and work upon four of these contracts will be started within the next two weeks. The whole of the timber bridge work is being handled by crews organized by the Department on a day-labor basis, and five of these crews are already in the field. Some contracts have been entered into by the department with the rural municipalities for certain works on Main Market road system, instructions have been issued to departmental foremen to undertake certain road improvement works in districts where the road organization of the municipality is otherwise engaged, or is inadequate to handle the works authorized. The whole of the ferries operated and maintained by the Government are in operation. Parties comprising surveyors and their assistants have commenced field work, and parties comprising constructional engineers are already busily engaged in completing preliminary engineering examinations for the contemplated works.

This Department reports that it has no positive knowledge of the amount which will be expended by the rural municipalities on public improvements, construction and maintenance, from their own funds, but H. S. Carpenter, Deputy Minister of Highways, estimates that a sum of not less than two and a half million dollars will be spent by these local governing bodies on the construction and the maintenance of roads and bridges in their respective districts.

The Minister of Public Works, Hon. A. P. McNab advises us that the building programme is going ahead very slowly. They are finishing their jail at Prince Albert and building a Hospital for the Tuberculosis League but this is practically all the buildings that are under way at the present time.

Estevan

Definite information from this town is rather scant. No municipal engineering works of any account are reported at all and in the building situation the same applies. The only thing of a definite nature that is projected, is a mile of electrical lines and the installation of a new prime mover and generator.

Regina

In Regina a fair volume of municipal engineering works is anticipated. New sewers will cost $21,892 and connections $10,000. For water mains it is estimated that $25,407 will be spent, while house connections and meters will take $17,000 and $7,262, respectively. To sidewalks $1,000 is being allotted.

For building work, the city engineer estimates that $100,000 will be devoted to warehouses, $150,000 to schools and $1,000,000 to stores, apartment houses residences, etc.

Saskatoon

In Saskatoon a very satisfactory situation considering all factors is disclosed in a report which has been received from the city engineer. $107,000 is an approximate estimate of what will be spent this year on municipal engineering works, while $1,035,000 may be allotted to building works in project. Of the municipal undertakings $31,000 will be expended on sewers, $36,000 on waterworks, $20,000 on sidewalks and $20,000 for paving.

Warehouses valued at $85,000 are contemplated, while other commercial buildings, including factories, will, it is expected, absorb $200,000. For universities and schools $50,000 is reported and for other types of construction work, including dwellings, a total of $700,000 is expected to be spent.

Province of Manitoba

The Department of Public Works of the Province of Manitoba is planning considerable important construction work according to a report which has been received by the Contract Record from W. R. Clubb, Minister of Public Works. The details of the expenditures are as follows:

Brandon Hospital for Mental Diseases, $534,000; Selkirk Hospital for Mental Diseases, $424,000; Road construction, $350,000; Reclamation Branch, $225,000. Total thus represented is $1,553,000.

Brandon

The secretary of the Brandon Builders Exchange, Mr. L. Beresford, writes that present indications are that residential buildings will form the major portion of construction activity in his city for the early part of the season. Supply men are making strenuous efforts to hold down material prices, and while the season will be late in starting, contractors expect it will be a busy one.

Winnipeg

Nearly three quarters of a million dollars will be devoted to municipal works in Winnipeg this year. In detail the items are $100,000 for sewers, $125,000 for waterworks. $200,000 for sidewalks and $250,000 for paving.

Building permits to date amount to $1,200,000 and are chiefly for dwellings. Schools to the value of $40,000 are projected.

Province of Ontario

In the estimates which were brought down in the last session of the legislature, covering the fiscal year ending October 31st 1924, the amounts voted under the head of Public Buildings and Public Works was $830,800. A large proportion of this sum covers additions and alterations to various provincial buildings throughout the Province, such as hospitals, normal schools, Ontario Agricultural College, court houses, registry office, etc. For re-building burnt bridges, in Temiskaming $10,000 has been allotted, while for drainage works on Rainy River and storage dams on the north branch on the Muskoka River $5,000 and $7,000 respectively have been voted.

For colonization roads, the amount voted was $857,300. This covers construction, maintenance, repair and extension in connection with the putting through of roads in Northern Ontario.

Under the jurisdiction of the Department of Public Highways, about $10,000,000 will be spent this year on provincial highways. In addition there will be the usual subsidies to counties and townships for work carried out on the county and township road systems. This will bring the amount to be expended by the province in aid of roads to about $15,000,000 or possibly more.

The estimates of capital expenditure by the Hydro-electric Power Commission of Ontario amount to $24,806,000, the bulk of which will be spent in the Niagara District. The amounts of course include expenditures for equipment as well as buildings and construction work.

The Temiskaming and Northern Ontario Railway Commission are allotted $1,650,000 under the estimates, $750,000 of this being for the extension of the main line north of Cochrane to James Bay. The remainder is for the construction of an extension to Larder Lake.

Port Arthur

Through J. Antonisen, city engineer of Port Arthur, we are able to give the following report regarding construction conditions in that city. On municipal engineering undertakings about $34,000 will be spent this year, largely on maintenance and repairs $24,000 of this will be for streets, while sewers, waterworks and sidewalks will take $4,000, $3,000 and $3,000 respectively.

With regard to buildings, there is no indication yet of what will be done in connection with office buildings and warehouses. The largest item is elevators costing approximately $2,500,000. The rest of the work is largely small, or of a repair nature.

Guelph

According to report received from the city engineer, the municipal activities of Guelph will not be neglected this year. Sewers, waterworks streets and sidewalks come in for a fair share of appropriations for construction purposes. The streets will involve the largest expenditure, the concrete pavement taking $102,000 and asphalt resurfacing $77,000. The sewer extensions that are contemplated involve an expected expenditure of $40,000 for sanitary sewers and $29,000 for storm sewers. Watermain extensions are more or less nominal and are slated at $4,000. The same amount is reported to be apportioned to sidewalks.

It is more difficult to gauge the amount of private buildings that will be undertaken in the city for the reason that very few definite prospects have come to light. In 1922 the value of building permits was $964,808. Already this year the amount of building that has got under way shows a substantial improvement over that of 1922 and it is fully anticipated by local authorities that during the remainder of the year a considerable advance will be made upon the figures established last year. Some architects and contractors in Guelph regard 1923 as a year of small house building although they are not certain as to the volume inasmuch as the rising prices have acted somewhat as a deterrent. There is some prospect of a new building at the Ontario Reformatory and a small amount of local industrial expansion.

Stratford

A. B. Manson, the city engineer, has just given the Contract Record an estimate of the amount that he expects will be spent on various classes of construction in this city during the present year. He intimates that about $210,000 will be spent on purely municipal work. This includes $30,000 for sewage disposal plant, $10,000 for general extensions to sewers, $5,000 for general extensions to the waterworks, $5,000 for general extensions to the sidewalks and about $160,000 for paving contracts. Thus it will be seen that Stratford has in prospect a fair amount of construction work of a municipal character .

As far as private work is concerned, Mr. Manson estimates about $250,000 will be spent on dwellings and similar projects and $40,000 for factories and commercial buildings. The returns indicate that so far this year Stratford is doing better in the matter of building than last year, and if the season develops according to prospects, the total established at the end of the year will undoubtedly be considerably higher than at the end of 1922.

Sarnia

Municipal work in Sarnia is not very extensive but one may take it from the figures that the city is planning a consistent improvement and development. $12,000, for example, is to be spent on sewers this year while $14,000 will be allotted to pavements. Apparently a large yardage of sidewalks is to be carried through as $10,800 is allotted to that item.

The building inspector of the city, Harry Walton reports that for the first three months of the year the total building was $139,315 as compared with $123,102 for the corresponding period of last year. If this substantial improvement continues, Sarnia will make a most excellent showing this year. The principal building thus far is residential, although a storey is being added to one of the hospitals and the new railway depot is being completed. $30,000 is indicated by the city engineer to be the value of commercial building work and the alterations that are under way.

Kitchener

Well over a quarter of a million dollars has been passed by the Council for municipal work in this city. This will indicate that there will be considerable activity this season. The largest item in the list is $220,000 for streets. Sewer work will involve $37,682 while waterworks are expected to cost $9,000. The rest of the allotment, $7,000, will be devoted to sidewalks. .

The value of permits issued in Kitchener so far approximates $300,000. This includes $10,000 for alterations to office buildings, $8,000 for addition to a factory and about $250,000 for various other types of construction.

Galt

Reporting to the Contract Record, D. T. Black, city engineer mentions $41,300 as the amount that will be spent this year on municipal construction undertakings. Of this sum he sets $30,000 aside for sewers, $2,500 for sidewalks and $8,800 for street paving. All of this work will be carried out by city labor.

Brantford

Brantford will have an active season this year if the programme of construction is carried out as anticipated. Both municipal and private work will bulk quite large and offer a busy season's work to construction labor in that city. Frank P. Adams, the city engineer, reports to the Contract Record that $198,000 will be devoted to construction work of a municipal character carried out under his jurisdiction. Of this amount $125,000 will be devoted to paving, $40,000 to sewer extensions, $25,000 to waterworks improvements and $8,000 to sidewalks. Other types of construction work are also in the fore with a new Lorne bridge costing $335,000, an addition to the Collegiate Institute valued at $81,000, another new school building to cost $40,000, a church that will involve $35,000, and an addition to the General Hospital Building at a cost of $60,000. In addition Mr. Adams intimates that $100,000 will possibly be given over to factories and commercial buildings. The erection of several residences is also contemplated, while there is a fair volume of work being completed that was started last year.

Taken as a whole then, it would appear that the prospects in the building and construction line in Brantford are brighter than during any of the past few years.

St. Thomas

Of the works under the direction of the city engineer, sewers will be the most important in point of value. W. C. Miller, the city engineer, states that $20,000 will be spent in this connection this season, but in addition to this he gives $5,000 as his estimate of the amount of work to be done on sidewalks and streets.

In other construction work he expects that a hospital costing $100,000 will proceed.

Kingston

Pavements are the most important class of work of a municipal character in Kingston this year. $130,000 is the amount that will be expended in this connection according to a report which has just come in to the Contract Record. Of other work within the field of the city engneer, sewers and sidewalks will involve and expenditure of $5,000 and $2,000 respectively.

General building in Kingston is in a very healthy condition. Reports reaching the Contract Record show the following items of importance: Bank of Montreal $135,000; Library of Queen's University $200,000; Nurses' Home $25,000

Chatham

$102,000 is the amount that will be expended on municipal construction undertakings this year according to an estimate of the city engineer, C. H. R. Fuller. He itemizes this figure as follows: $35,000 for sewers; $7,000 for waterworks; $10,000 for sidewalks; $50,000 for asphalt pavements.

Mr. Fuller finds it very difficult to make an adequate forecast of the building prospects in Chatham inasmuch as the cold spring and somewhat high cost of building materials has delayed a start on active opererations. However, there is no doubt but that as the warmer weather approaches, the situation will considerably improve and building open up in reasonable volume. For the present however, no definite figures can be offered.

Sudbury

The general construction situation in Sudbury is quite satisfactory. As far as municipal work is concerned nothing has been authorized at this writing for sewers, waterworks or sidewalks, although the city engineer intimates $13,000 will be spent on penetration tar macadam road.

Other types of construction, some items of which are quite important, bulk into a considerable sum of money. The city engineer lists these as follows: Harris Abattoir $10,000; Public Schools $40,000; Separate Schools $75,000; Three churches $60,000; Factories and Commercial Buildings $85,000, other construction work $12,000.

These approximate figures certainly indicate that Sudbury will not be experiencing an inactive season this year. Other projects will undoubtedly develop as the season progresses and help to swell the total.

Renfrew

The town engineer, J. R. Stewart, reports that in Renfrew the amount of proposed work is rather slim. The town council are getting the estimates and so far no sewer or sidewalks are in contemplation and there is a possibility of only some waterworks extensions at $7,500 and a tarvia macadam street at $10,000 going ahead.

Additions to factories in the town are considerable, these involving an expenditure of $10,000. Besides these, other construction work approximating $20,000 in value will possibly materialize.

Aylmer

In this town very little work of any character is in prospect for which reason W. E. Stewart, the town engineer, has been obliged to answer most of our inquiries in a negative strain. The only items he lists are the sewers on Raglan and South Sts., estimated to cost $1,300 and the grading of the Talbot Road from St. Thomas East, to three miles East of Aylmer. On the other types of construction work Mr. Stewart reports that nothing definite is in prospect.

Sault Ste Marie

No. very definite prospects are brought to light in the report which we have received from the city engineer concerning Sault Ste. Marie. As far as sewers, sidewalks and streets are concerned, he indicates that none will projected. Waterworks however will require an expenditude of $12,000. He details this work as follows: 1,500 ft. of 6 in.; 1,800 ft. of 4 in.; 1,200 ft. of 16 in. cast iron pipe.

A $10,000 building for the Northern Feed & Seed Company and the proposed Gas Plant are the only items in the building line that are reported.

Pembroke

While Pembroke is one of the smaller towns, its construction needs will not be neglected this year if we are to judge from a report which has been made to the Contract Record by J. P. Howe, the town engineer. $254,200 is the value that he placed on projects that are in immediate contemplation. Itemizing these, schools will absorb $140,000, warehuses $20,000, and other private construction work $50,000. Municipal expenditures in prospect include $15,000 for waterworks, $12,000 for sidewalks, $15,000 for streets and $2,200 for sewers.

Toronto

For municipal engineering works in the city of Toronto $9,730,000 will be definitely spent this year. $5,000,000 of this will be for sewers, roadways and other work carried on through the local improvement scheme. $1,000,000 will be for waterworks improvements, $400,000 for relief sewers and $750,000 for a new bridge on St. Clair Ave. The maintenance of public works is carried through by revenue derived from taxation. This year $2,580,000 will be provided, as follows: $700,000 for roadways; $200,000 for sewers; $180,000 for railways and bridges, and $1,500,000 for waterworks.

Toronto is being pressed more closely as each month passes by the need of certain public utilities, or enlargement of present utilities, which involve enormous sums of money. It is practically certain that on January 1st next the ratepayers will be called upon to vote upon a duplicate waterworks system, which will cost about $14,000,000.

The present system is taxed to its capacity in supplying water for not only the whole city, but sections of the townships of North York and Scarboro as well.

Commissioner of Works Harris has had plans for a duplicate of the existing system prepared since 1912, and during the past months these plans have been re-checked and brought up to date.

This $14,000,000 expenditure will have no effect on the tax rate, however, as the water supply utility in Toronto carries itself out of the revenue produced. The new plant will be called upon to pay all of its carrying charges as well as its principal cost. Money for investment in revenue producing utilities is always available, so that the city's borrowing power will not even be affected.

Another task which must be carried out very shortly is the installation of a $12,000,000 sewage disposal plant for North Toronto. Plans and specifications for this work will be ready this year.

It has been made clear that the present sewage disposal plant at Morley avenue, which serves the entire municipality, can handle very little more. This means that another sewage plant will have to be constructed, which will probably demand ten million dollars.

Further large expenditures are slated for this year, chief amount them being approximately $5,000,000 for new plant and trackage for the Toronto Transportation Commission. Some indication of the nature of the buildings being erected under this scheme is given in the descriptions which appear elsewhere in this issue.

Another large construction project is the new Trinity College, the first portion of which has been started. The part alone is costing $600,000 and it is expected that the whole scheme, as it will ultimate develop, will involve between two and three million dollars.

The two large departmental stores of the city are also building extensive additions, that of the Robert Simpson Company costing nearly a million dollars and that of the T. Eaton Company $1,500,000. Several large office buildings have been projected, one of them the Bowles office building being three quarters of a million dollar proposition while the Commerce Building on which it is said work will start shortly will cost somewhere in the neighborhood of a million. The new assembly plant of the Ford Motor Company in the east end of the City is costing about $850,000 and the Reception Hospital on which tenders have just been taken will involve an expenditure of $350,000. St. Andrew's College are also planning an early start on their new buildings and $400,000 may be estimated as an approximate figure of their cost. The Bell Telephone Company has expended large sums in new exchanges while the various religious demoninations are actively engaged in building new church premises or enlarging old ones; perhaps $1,500,000 to $2,000,000 is being spent in this connection.

The Board of Education programme for this year includes the completion of the Jarvis Street Collegiate at $645,000; an addition to the Humberside Collegiate, $175,000; several other school additions at prices well over $100,000 as well as smaller items, the total being approximately $1,700,000.

Homes in Toronto are being built at a very rapid rate and quite likely the number will not fall short of the number erected last year. The expenditure on this class of work will be very close to $20,000,000.

London

The outlook in the building situation in London is very promising. The list of buildings under way or in prospect including the new city registry office, $66,000; St. James Church additions, $15,000; Trafalgar School, $96,000; monastery for the Sisters of the Precious Blood, $105,000; monastery for the Redemptorist Fathers; an addition to Knox Church, $50,000; store and apartments on Dundas Street, $15,000; new plant for Reid Bros & Co. Limited, to replace the one damaged by fire. In addition there are a large number of residences varying widely in price.

Hamilton

Mr. R. A. Land, the secretary of the Hamilton branch of the Association of Canadian Building and Construction Industries, has submitted the following information regarding the outlook for 1923 in that city:—

Outlook.—A recent canvass of our local architects has been made, and they tell us that they will have much new work to be announced in the immediate future. A large portion of this, they say, is laid-over plans, set aside by industrial concerns who have been awaiting lower costs.

We find there is considerable money to be spent on public buildings, new hospitals and extensions, as well as several churches to be built in the newly developed districts of our city.

We think 1923 will exceed last year's records quite substantially. It is our belief that during the past few years, many industrial concerns have been holding off building, and even curtailing expenditures on improvements, alterations, and general repairs for upkeep, in the expectation of lower building costs. Now these concerns are going to proceed with this held-over work, as they feel that costs will not go lower, but on the contrary will increase.

Material Prices.—At present, cement is cheaper, but other material, including brick stone, lime and lumber show advances, with further advances probable.

Labor.—The labor supply during the past season was normal, with the exception of a marked scarcity of bricklayers and plasterers throughout the entire summer. Even to day there are not enough plasterers to do the work under way at present. A few carpenters are unemployed, but this will be only for a short time. While we have been able to get carpenters, all along, still the better class of these mechanics are quite scarce, and hard to get. There is plenty of unskilled labor available. Painters, electricians, and plumbers have been available for all work, and we believe will be able to handle the work for the coming season.

General. The future points to higher costs, and we have already received demands from some of the trades on new agreements at higher rates for the approaching season.

This includes masons, carpenters, bricklayers and plasterers, who are seeking increases, and their demands will probably have to be met.

Ottawa

There is every indication that during the present year Ottawa will witness the continuation of the building movement started last year. It is expected that a great number of buildings and residences will be erected this season judging by the number of permits already issued. The supply of residences is at the present time just about equal to the demand, and a fact to be remarked is that the newly built homes are taken up by their owners.

Within the city limits and in the immediate surrounding suburbs, over 1,000 detached and semi-detached residences have been erected during year 1922, these ranging in cost from $6,000 to $75,000, the majority, of course, being houses costing between $8,000 and $10,000.

Some large apartment houses have also been built.
houses have also been built.

The present building activity is not limited to houses. Large buildings have also been erected simultaneously with the building of homes and the prospect for the continuation of this building activity is most encouraging. It may be stated here that very favorable agreements have been reached for the current year between the working unions and the contractors, which will naturally help matters to a considerable extent. Among the large buildings erected during 1922, or now being completed are: the new $3,000,000 civic hospital; the Canadian Bank of Commerce building which will soon be ready for occupation; the two public baths built by the city, two steel and brick buildings which will cost $80,000 each; a new lower town departmental store located at the corner of Rideau and Dalhousie Sts. and which will cost over $150,000, and a number of other buildings of less importance.

In addition to the buildings actually under way there will be the construction of the $350,000 auditorium, the new government printing bureau, and two large office buildings and stores, one on Sparks St. and the other at the corner of Sparks and Bank Sts. This together with the decided completion of the tower of the main Parliament Buildings, will provide work for a large section of the working classes for a considerable length of time as they will involve the expenditure of several hundred thousand dollars.

Niagara Falls

Prospects for the coming season look good. An eight-room two-storey addition is to be built to the Maple Street School, probably costing about $80,000. The Victoria Park Commission are anticipating building a protection wall 700 ft. long, and doing a lot of park illuminating this season. Several bathing houses are to be erected at Dufferin Islands. The Lundy's Lane Methodist Church are going to build a Sunday-school, to cost about $38,000.

Peterborough

Mr. J. K. Sheehy, the secretary of the Peterborough Builders' and Supply Association, states that building prospects in that city are looking better at present than they have for some time, but owing to the late spring, things are a little slow in getting started.

Tenders have been called for on several jobs, such as the Ennismore Church, and Brown's Garage. The Salvation Army building is also going ahead.

Other work includes: Sub-station for Utilities Commission; factory addition for the Brinton Carpet Co.; factory addition for the DeLaval Dairy Co.; sunday-school for St. Luke's congregation; sunday-school for St. Andrew's congregation.

There are also a number of residences and summer cottages at Chemong Lake.

The Board of Education are planning an addition to the Collegiate Institute.

Province of Quebec

Federal Government Activities

The Government at Ottawa is to spend about $5,000,000 on the Montreal harbor during the coming summer. Part of this is the completion of work started last summer on the extension of the Alexandra Pier and The King Edward Pier. The main item of interest will be the construction of a new modern concrete and steel grain elevator and the installation of the supplementary discharging and loading equipment. It will have a greater capacity than any of the present elevators and the estimated cost is set at about $3,000,000.00. The work is to be done by day labor under the supervision of the Harbor Commission's Engineering staff. It will be a distinct addition to the facilities of the Harbor which were taxed to capacity last year and the shipping trade welcome the addition.

The present grain elevator "B" at Windmill Point is also to be extended this year and tenders are to be in the Commission's hands by the end of the month. This will also greatly enlarge the grain handling facilities of the port.

The Federal Dep't. of Public works is undertaking the extensions and repairs of old wharves and the construction of new ones at various places along the lower St. Lawrence.

Provincial Government Activities

One of the main items on the program of this department is the completion of the new Court House addition at Montreal. This is to be a considerable undertaking costing about $2,500,000 to complete and it is not epected that the contractors will more than get the walls in place before snow flies again. The interior work will proceed during the winter months. No other single item will cost as much as this and the programme otherwise is about the same as last year though no detail could be obtained for this issue.

The Quebec Liquor Commission has not an extensive building programme for this year as considerable money has been spent during the past to properly house the commission. This has been mainly spent on distributing warehouses and not on elaborate or costly stores.

Quebec Streams Commission

The principal work which The Quebec Streams Commission will have to supervise this spring will be the construction of storage dams at Kenogami. The contract for this work has been awarded to The Nova Scotia Construction Company, Limited, at a price of nearly one million dollars. The work is now under way. In connection with this storage scheme, a large area of land will be flooded,—most of which is owned by settlers and it will have to be expropriated. It is estimated that the acquisition of the flooded area will cost about $750,000. The Commission will also have to build 20 miles of highway, for which contracts will soon be awarded. Engineers are now locating this new highway which will connect the towns of Jonquiere and Hebertville .

The Commission will also investigate the storage possibilities in the Gatineau River watershed. Lakes Kakabonka, Baskatong, and others shall be examined.

The Blanche river, which flows into the Ottawa river at Thurso, shall also be studied as to the possibility of regulating its discharge.

An investigation and survey shall be made of lakes which are tributaries of the Rouge River, with a view to improve low water conditions on the said river.

Surveys commenced in 1921 of Lake Duparquet, in the Abitibi District, shall be completed this year.

Plans and specifications are being prepared for a storage dam at the outlet of Lake Mitis, on the Mitis River. It is expected that this work shall be proceeded with in the course of this year. The estimated cost of this work is about $200,000.

Montreal Municipal Expenditures

The city of Montreal is to undertake considerable municipal work during the coming summer. The total cost of the work as outlined is about $5,000,000 divided proportionately among the more important kinds of improvements. Roads and paving, including new work and repair work, are to receive about $2,500,000 or half of the total amount. These will be principally asphalt roads and should add greatly to the efficiency of the transportation routes.

Sidewalks, both concrete and flagstones, are to receive $500,000. This amount will be mainly spent in laying new sidewalks as last year work was mainly devoted to repairs of old sidewalks.

Sewers which will be laid mainly in new districts are to cost $500,000. These will be mainly of brick and designed in such a way as to meet the needs of the locality for many years to come.

Water-mains which as a rule follow the sewers are to cost $1,500,000. It should be noted that the major portion of this is to be spent on improvements at the low level pumping station and the aqueduct, where work is already under way the contractors having begun where they left off last fall.

Apart from general improvements the city is proceeding at once on the re-construction of the City Hall. This work is to cost about $1,500,000 and tenders are being asked shortly—before this goes to print. The steel superstructure is in place in the old walls and the remaining work will soon be under way.

The Ontario St. subway under the C.P.R. is being lengthened and widened and will take nearly until winter to complete.

St. Lambert

The total cost of their two years' programme of work is about $1,000,000 of which about half is to be spent this year.

The money is to be spent upon new roads, new sidewalks, new sewers, new watermains, improvements to the power station and lighting system.

Most of the new work is in newer parts of St. Lambert which have grown so rapidly during the years since the war.

Most of the road work will be done next season but the work on sidewalks and sewers is to be completed by October 1st. 1923.

Private Enterprise

Private corporations show signs of being very active in the Province during the coming season, many different industries being affected in the programme. The attitude of The Provincial Government is always "welcoming" to those capitalists and investors who are most desirous of making safe and sound investments of their money. An unusual amount of United States' capital is coming into the Province this year; capitalists have usually considered this a safe place to invest their money.

Hydro-electric Developments

It is hardly possible to mention all the work to be undertaken and much less possible to enter into details concerning any one in particular. The hydro-electric field is being considerably developed this coming year, chief among which are The Quebec Development Co's. huge scheme at the Grand Discharge from Lake St. John; The Shawinigan Water & Power Co's. new development at La

Gabelle on the St. Maurice river about 20 miles above Three Rivers. Also under the terms of agreement with the Prov. Gov't. the syndicate who purchased the power at the Quinze rapids will be probably undertaking the work in this connection some time this year. The Montreal Light, Heat & Power Co. are also adding some more units to their already large plant at Cedars Rapids. Price Bros. & Co. Ltd., are about ready to instal a single unit of 10,000 h.p. in a new power house recently erected at Chicoutimi. The Lower St. Lawrence Power Co. are about in a position to start supplying light and power to the municipalities on the lower St. Lawrence. It is very probable that work will be commenced this year on a development for the Ottawa & Hull Power Co. at Calumet Island on the Ottawa River. The Southern Canada Power in all probability will start construction of a fair sized plant at Drummondville. This will not start before the fall of this year. The Montreal Island Power Co. Ltd., which has been recently incorporated, has an excellent site on that branch of the Ottawa river flowing back of Montreal Island and it is probable that they will undertake construction this year. The rumour is again in the air that the site on the Ottawa River near Caribou is to be developed this year but this information is not definite. There are rumours that the St. Lawrence River near Montreal is to be developed by a well-known Montreal Company. This report, although apparently well founded must remain more or less indefinite as to principals and site.

The water power on the Quinze River which was recently acquired by the Northern Canada Power Co., a Toronto Syndicate, is to be developed this summer as far as possible. The Northern Ontario mining towns are in great need of power, some of the mines being obliged to use steam generated power to make up their total needs, so that the addition of 20,000 h.p. should soon be absorbed.

It will be seen from the foregoing outline that the water power resources of the Province are receiving due consideration by capitalists. The total amount of power to be developed this year will probably exceed 600,000 h.p. It is not possible to give an accurate estimate of the cost of these works as the information is not all available but allowing a minimum figure of $100.00 per h.p. this would involve an expenditure of $60,000,000. As a matter of fact a unit cost of $100.00 per h.p. is probably 25% below the actual cost.

Paper Making Industry

There are a number of new construction undertakings in view for this year in the paper making industry. The most important are as follows: a new company composed of men who are already well known in this industry is being formed and will operate under the name of the Quebec Pulp & Paper Co. Ltd. They intend to erect a groundwood mill to start with and this will be located at Sillery, near Quebec.

The Walmsley Co. of England, manufacturers of paper machines, are going to commence operations in the old Armstrong-Whitworth plant at St. Lambert. Many of their machines are in operation in Canada at present but this company is making further efforts to instal their machinery in future.

The Belgo-Canadian Pulp and Paper Co. of Shawinigan Falls are installing two new paper machines in a new building which was constructed last year. The Walmsley Co. are supplying one machine and The Dominion Engineering Co. of Lachine are supplying the other. The total cost of this new installation and the building to house it will be about $1,000,000 allowing about $100,000 for the cost of the building. This will make the Belgo Co. one of the largest producers of newsprint in Canada with five machines in operation.

Price Bros. & Co. Ltd., are intending to instal 2 more Walmsley machines in their plant at Kenogami. This company appear to steadily increase their capacity year by year. They are actively interested in the new hydro-electric development at The Grand Discharge and have still further interests at Chicoutimi along the same line.

J. Ford & Co., of Portneuf, manufacturers of various kinds of paper and paper bags, are about completing a new dam and paper mill at Portneuf. At date of issue the mill is built and the installation of machinery is about to begin, while the dam is nearing completion. A short time should see the whole project practically completed and ready for operation. The cost of the dam and new mill building will be about $250,000 exclusive of machinery. This company has been located in Portneuf for many years and has developed a strong business, as the present activity indicates.

Railways

The railway companies have adopted a fairly extensive programme of repair work on their lines in the province. Some bridges are to be replaced by more modern types and others will be repaired. The companies are just now placing fair sized orders in local mills for rail accessories such as bolts, spikes, plates, etc. Railway stations, apart from terminals, are to receive considerable attention in the nature of renewals and improvements.

The most important work being undertaken by the C.P.R. is the completion of the Chateau Frontenac at Quebec and the completion of the Interprovincial & James Bay railway to the Quinze River in Temiskaming district.

The change in directorate of The Canadian National Railways and the subsequent change of location of the general offices has entailed considerable repair work and alterations to various buildings to properly accommodate the staffs. The Canadian Express Building has undergone a complete change on several floors to make the space suitable and the big building formerly occupied by Almy's store is being almost wholly altered to provide room for other departments. The ground floor will not be used by the railway company.

The Government has not yet passed the railway estimates and our correspondent was unable to secure from the engineering department any definite idea of the work which is to be undertaken here in Quebec during this coming season. This outline will appear in a later number of Contract Record in considerable detail.

The Traction Companies in the various towns and cities are making minor improvements in some cases and in other cases more extensive. The Montreal Tramways have placed orders for more rolling stock to keep up with the demand on their system. This has been placed at a local factory. Many of their lines in various parts of the city are being replaced this year with permanent concrete road-bed and heavy rails. Actual extensions into new territory will not be many but the main work will be done towards keeping the present system in a high state of efficiency.

The Three Rivers Tramways Co. which is a subsidiary of The Shawinigan Water & Power Co. Ltd., is making a considerable extension from the centre of the city out to the St. Lawrence Paper Mills Ltd., new plant, about 1¼ miles to the West. The city is spreading rapidly in this direction and and the recent addition of another large plant in this district will accelerate the expansion westward.

Montreal Buildings

All present indications point to an excellent development of general building in Montreal during the coming season. The number of permits issued at the City Hall is not so large as last year but the amount involved greatly exceeds last years' figures. A comparison follows:

January 1 to April 30th 1922, No. of permits 1,311; amount involved, $3,752,107.00.

January 1 to April 30th. 1923, No. of permits 1,164; amount involved $9,714,482.00.

From April 30 to May 15th 1923, No. of permits, 650; total cost, $7,250,000.

This year to date, $16,964,482.

The following list gives an idea of where the money is being spent:

Provincial Government, new Court House, superstructure only, $2,364,947.00.

Drummond Investment Co. Drummond Court apartment house, total cost, $1,350,000.00

Morgan Realties, new store for Henry Morgan & Co. Ltd., new boiler house included, $1,250,000.00.

Bell Telephone Co. of Canada, new automatic exchange bldg., $550,000.00.

Dupuis' Freres, departmental store, $400,00.00.

Protestant School Board 2 schools, $350,000.00.

Badgley Construction Co. Ltd., a groups of houses, 24 in all, unit cost $8,000 each, $192,000.00.

Drummond, McCall & Co. (warehouse), $175,000.

Provincial Government are erecting a new building on St. Urbain St., $125,000.

Lafond & Baillorgeon, University St. apartment house, 4 storeys, $98,000.

Garage Centrale, St. Denis St. garage, $50,000.

Orange Crush Bottling Co. Ltd., factory, $50,000.

Columbus Rubber Co. factory, $34,000.

A glance at the figures quoted above will show that building activity will be greater in Montreal this year than for many years past. Our Montreal correspondent has called upon many engineers and architects during the past several weeks and their outlook is invariably one of optimism for the immediate future. It should be a bouncer year for the building trades in Montreal City.

The various municipalities around Montreal are reflecting the general conditions as found in the City. Heavy permits for building have been issued in Westmount, Outremont, Verdun, Montreal West and Lachine, but mainly for residences. These do not involve such an imposing sum of money but represent work and livelihood for many hundreds of men, as well as relief from the shortage of dwellings.

A new Golf Club has recently been formed called The Marlborough Golf & Country Club with club house and course at Cartierville about 5 miles outside the city limits. The shareholders list is about to be closed at any time as they have enough money in hand to proceed with the construction of a new course and clubhouse. This work will involve an expenditure of $300,000 most of which will be spent this year. It is a striking comment on the popularity which this game has assumed in recent years.

The Insurance Exchange Building is one which deserves special mention for its size and importance. The wrecking of the buildings is about complete and several landmarks disappeared during the process. Excavation for the new foundations is well advanced and the walls will soon appear above the hoardings. This building will represent an expenditure of a large sum of money as it occupies one of the most valuable sites in the City. Many of the insurance companies will make their new home there, and it will form an imposing addition to the business district of the commercial metropolis.

It has just come to our attention that a 10 storey office building is to be erected this year on the corner of MacKay St. and St. Catherine St. Excavation is to be started about June 1st. This location is considerably farther west on St. Catherine St. than any other office building but the commercial section is fast moving westwards and their pioneering will no doubt be justified. The building is to be of reinforced concrete construction and will occupy an area of about 15,000 sq. ft. The contract price could not be ascertained.

The town of Mount Royal which is situated at the West end of the tunnel through the mountain is building up very rapidly. Last autumn the syndicate which owns most of the land entered upon an extensive plan to build 102 semi-detached houses, and at the time of going to press they are starting on 60 more. All those that were started last fall are occupied now and those just started will be occupied by fall. The only chance of plans going astray will be due to the shortage of labor of all classes which may be felt before next winter interferes with general building operations. Many of the large constructional works going on in other parts of the Province are drawing men in large numbers from the city as these works show every indication of continuing throughout next winter Employers here are already beginning to remark on this though the activity here is only getting under way.

Schools

The programme of both Commissions, Catholic and Protestant is very extensive for the coming season.

The Protestant Board's work does not call for many schools or the expenditure of so much money, but when the ratio of population is considered it will be seen that their programme represents probably a greater expenditure per taxpayer. It includes large schools in widely separated districts. The Rosemount School is designed for about $200,000. The new school in Ville Emard for which plans are being prepared is to contain 22 classrooms and will likely cost $300,000. This one will not be ready for pupils until sometime in 1924, though the Rosemount School should be ready this year. These two schools make up the total work proposed by the Protestant Board. The new accommodation will handle about 1,600 pupils. Total cost, about $500,000.00.

The Catholic School Board has its territory divided into four districts, east, west, north, and centre and each district in turn is divided into several parishes. Each parish has its school or schools as the necessity arises and each succeeding year sees one or other in need of fresh accommodation.

This year the centre division is to receive 2 new schools of 16 classrooms each, and the estimated total cost is $290,000 or about $9,000.00 per classroom.

The west division will require 3 schools as the expansion of the city is more pronounced in the districts farther from the city. One school will contain 16 rooms, another 19 rooms and the third which is the initial part of a large school will contain 8 rooms. The cost in consecutive order is to be about as follows:—$140,000; $145,000 and $55,000 making a total of $340,000.

The east and north divisions have each adopted a programme corresponding to those outlined above. The north division also is building a large residence for the teaching staff, plans for which are just out and tenders must be in hand by May 30th.

Sherbrooke

A quarter of a million dollars for municipal engineering works is what the city engineer of Sherbrooke expects to go through this year. Itemized, this amount divides itself as follows: $20,000 for sewers; $30,000 for waterworks; $45,000 for sidewalks, and $125,000 for streets.

A bridge at $45,000 is also an item of importance. Buildings that are under way or projected include a Protestant School at $100,000, a Baptist Church at $35,000 and factories at $30,000.

St. Lambert

In the city of St. Lambert there will be quite a considerable amount of construction activity this year. E. Drinkwater city engineer and director of housing, reports that sewers to be built this year will involve an expenditure of $75,000. Waterworks will take another $65,000, roads and sidewalks will involve $70,000 and $220,000 respectively.

The bulk of the building will be dwellings of, which $800,000 worth are projected; in addition there will be an office costing $10,000.

Quebec

In addition to a number of residences, the programme for Quebec City for the present year includes buildings for: Laval University, $500,000; Quebec Basilica, $450,000; Court House addition, $450,000; Chateau Frontenac addition, $1,000,000; Laval Hospital for Tuberculosis, $350,000; Quebec General Hospital, $400,000; Four new schools, $600,000; Quebec Liquor Commission Warehouse, $2,000,000; Quebec Exhibition, $150,000; Various factories, $650,000 and Museum of Arts, $200,000.

Province of New Brunswick

According to B. M. Hill, Provincial Road Engineer of New Brunswick, their expenditure on roads will be approximately as follows:

Provincial expenditure on patrol & maintenance, $600,000; Permanent road expenditure $350,000; Permanent bridge expenditure, $500,000; Municipal expenditure, $150,000.

Thus $1,600,000 will be devoted to roads in the province of New Brunswick.

Fredericton

It is stated that in Fredericton there is likely to be a number of residences constructed this season and also a Memorial Hall for the University of New Brunswick at a cost of $80,000, and a school of eleven rooms valued at $120,000.

St. John

Quite a considerable amount of municipal engineering works are projected in St. John. Mr. Hare city engineer, lists these in a detail report which he has submitted to the Contract Record. This report includes the following items:

Replacements of obsolete sewers, $39,200; replacement of small and old leading and distribution water mains, $230,450; new sidewalks, $10,000; street repairs, $17,000; new paving, asphalt, with a small amount of granite block, $50,000.

Ordinary building includes items covering almost all classes: $10,500 is the estimated expenditure covering an addition to an office building while $151,600 applies to schools which were started in 1922 but not yet completed. New churches are estimated to involve $50,000 while $34,500 will be spent on factories and commercial buildings. Repairs and maintenance of city wharves, warehouses and fences, is an item that will require $230,000. In addition, $300,000 will have to be spent on the civic distribution and street lighting system.

Province of Nova Scotia

According to information received from R. W. McCollough, of the Provincial Highway Board, the proposed provincial expenditures of the Province of Nova Scotia for 1923 approximate $3,000,000. Federal aid for road work will be $100,000. No county or municipal expenditures are anticipated.

Halifax

F. W. W. Doane, city engineer, estimates that $35,000 will be spent for sewers for 1923, $50,000 for waterworks, $30,000 for sidewalks, $95,000 for paving and $100,000 for maintenance of streets.

New Glasgow

The whole district around New Glasgow is gradually reviving from the industrial depression that was so acute in 1921 and 1922 and it is fully expected that greater activity will be evident during the present year. The following information has been supplied to us as covering the whole county of Pictou which embraces the towns of New Glasgow, Stellarton, Trenton, Westville and Pictou.

Sewers: Small extensions have been suggested by the Councils of New Glasgow, Stellarton and Trenton, but to date nothing definitely has been settled regarding these.

Waterworks: No plans for extension or enlargement have been discussed by any of the towns.

Sidewalks: Town of Pictou has just let contract for concrete sidewalks approximate cost $6,000 to Fraser Paving & Construction Co. of New Glasgow. Town of New Glasgow has petition from ratepayers for extension of concrete walks. No action at this date.

Streets: New Glasgow proposes asphalt topping about 3,000 sq. yards of old concrete. Tenders not yet called.

Office Buildings; None so far as can be learned.

Schools: Town of New Glasgow has voted issue of bonds to erect a 4 room brick schoolhouse, to cost approximately $25,000 and will shortly call for tenders.

Factories: Mattress factory owned by Steel Furnishing Co., of New Glasgow, and destroyed by fire two weeks ago, will be rebuilt. Cost about $10,000. Contract let.

Other Construction Work: Extension of coal loading pier at Pictou Landing by Acadia Coal Company. Contract let to Walter Chisholm. Oddfellows' Home at Pictou; renovation and extension, contract let. Work will cost approximately $40,000. Canadian National Railway Station, New Glasgow, burned 3 months ago, will be rebuilt at once. Cost said to be about $75,000.

Sydney

A reasonable amount of municipal undertakings will be carried through in Sydney this year according to the reports which have just reached us. Sewers will take $25,000 and waterworks a similar amount. For sidewalks and streets $60,000 will be devoted, $30,000 to each.

With the exception of an hotel to cost $400,000 there is very little building work definitely in prospect.

Kentville

This town is not anticipating any great activity this year with the exception of about $10,000 spent on municipal improvements. Of this amount $6,500 will be devoted to waterworks and $2,000 and $1'500 respectively to sewers and paving. As far as buildings are concerned, six or eight $5,000 houses will be built but nothing else is definitely projected.

Truro

J. G. W. Campbell, town engineer, reports that as far as sewers and waterworks are concerned, no work is likely to go ahead this year. The only projects of a municipal character will be about 1,500 square yards of sidewalk costing $2,700 and 1,400 square yards of concrete pavement valued at $4,200, all of which will be carried through by day labor.

As far as office buildings, warehouses, schools, factories or commercial buildings are concerned, Truro will be inactive this year. A new brick building for the Provincial Girls Home and small alterations to the East End Methodist Church, however, will provide some work. In addition there are five dwellings costing $25,000 under construction.

Prince Edward Island

Charlottetown

For sewers, waterworks, roads and sidewalks in Charlottetown $59,000 is included in an estimate just received from J. P. Nicholson, city engineer. This amount is allocated as follows: Storm water sewers, $7,000; waterworks extensions, $9,000; concrete sidewalks, $11,000, and asphalt paving $32,000.

The biggest item in building is the Roman Catholic hospital valued at $100,000. Other items are more or less nominal and include a store valued at $10,000 and dwelling $6,000.

Summary—$500,000,000 in Prospect

In attempting to give, in summary form, a bird's eye view of the construction prospects in Canada for 1923, we are depending largely on the reports, as printed above, which have come directly to the Contract Record from officials of the municipalities or provinces concerned. In this way an authoritative character is given to the figures. Of course, it must be remembered that while those reports that are presented are widely representative of the whole country, many towns, more especially the smaller ones, are not included because of the difficulty of obtaining data of useful value. While, individually, these towns would not contribute greatly to the total of construction, in bulk they might amount to quite large proportions. Also there must be taken into consideration the fact that, in building construction particularly, a very large proportion of the projects which will be started this year have not yet come into view and may not for several months. Indeed, each day brings forth new prospects that it is impossible to forecast. For reasons such as these, then, it is permissible to multiply our total by some factor that will, in accordance with good judgment take care of these uncertainties. As far as public works by the municipalities and provinces themselves are concerned, the figures fairly accurately represent this year's expenditures for they are generally brought down in estimates and approved by governing bodies before any of the year's work is proceeded with. Bearing all these facts in mind, then, the following summary is presented:

Expenditures during 1923 by: Dominion government, $32,248,000; provincial governments, counties and townships, $74,660,000; municipalities - public works, $48,338,000; private construction and buildings, $116,395,000; total, $271,641,000.

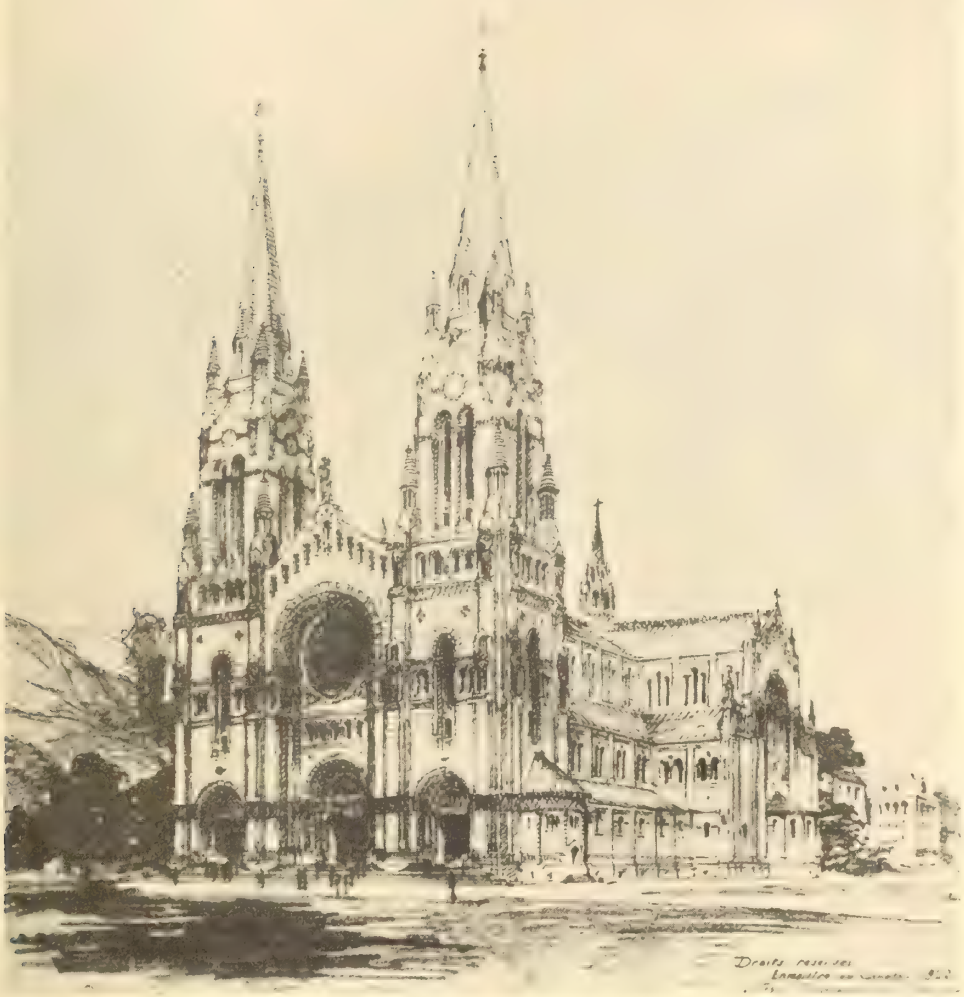
It can safely be assumed that the item "private construction and buildings" can be multiplied by three to determine the total amount of this class of work that will be carried through this year. On that assumption an estimate of this year's construction would show a value of $503,000,000. Of course, considerable of this work, although started this year, may not be completed until next year or even subsequently.

The Morgan departmental store as it will look when completed

Big Addition to Montreal's Shopping District

For many years past Henry Morgan & Co., Limited, has been noted as one of the best and most reliable departmental stores in Montreal, and their clientele has gradually but continuously increased until they find themselves in the present position of being obliged to enlarge their store. They also have a large building a few blocks away which is used as a factory and which will, no doubt, be vacated by them upon completion of the building now under construction.

The new building is being built onto the rear of their old store which faces on Phillips Square, and the whole structure including both old and new parts is bounded on three sides by important city streets. On the north side there will remain several small buildings between the new store and the fourth street which forms the block. These buildings also belong to the same firm, but are not all used by them. The area in the block is approximately 100,000 sq. ft. The building formerly known as Bell's Galleries, which was moved recently, occupied a part of this area but was shifted to another place further north. A detailed description of this process appeared in Contract Record of May 16th.



L. N. Audet and J. E. Daoust, Associate Architects

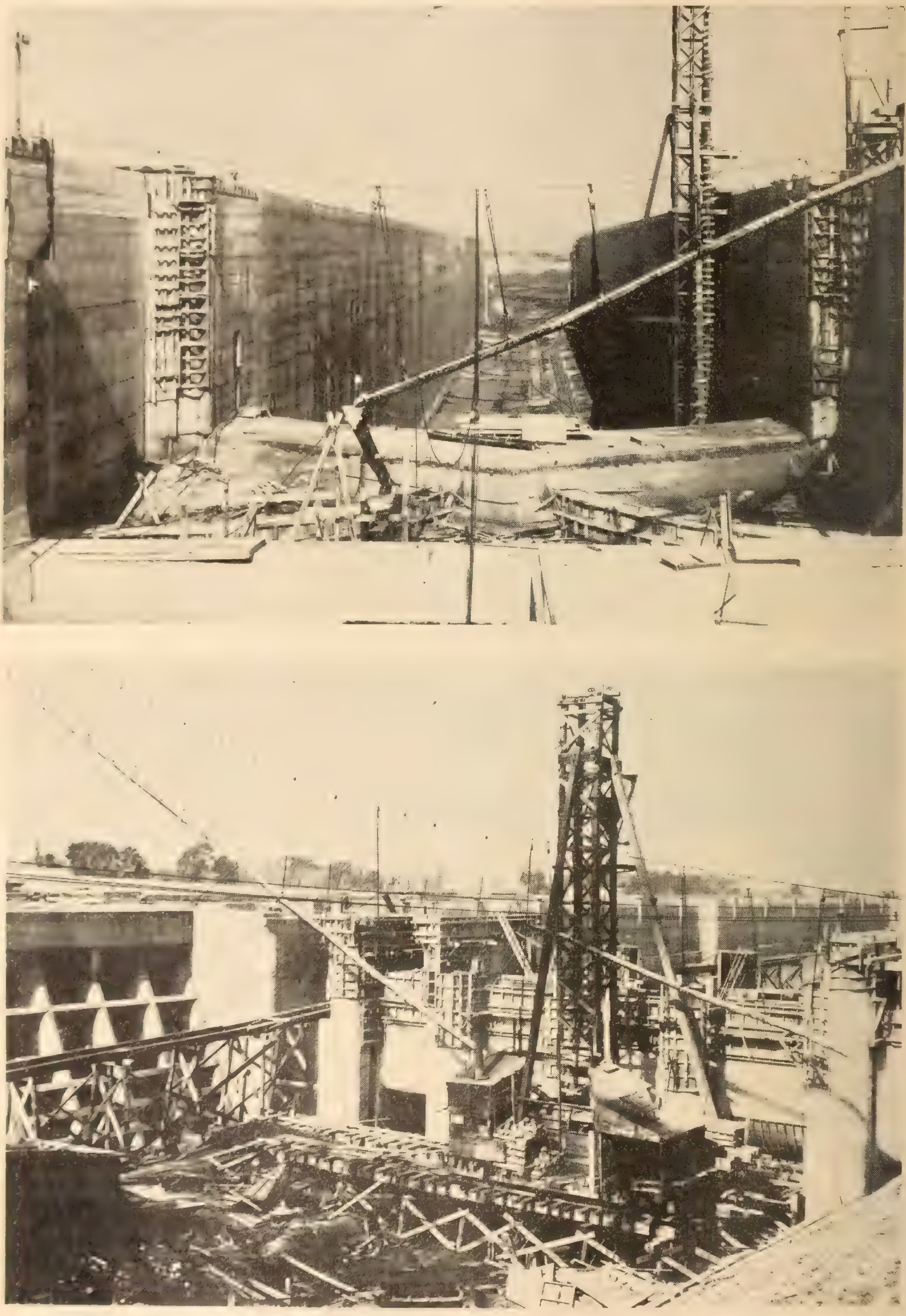
This Beautiful Edifice Will Replace the Basilica at Ste. Anne De Beaupre Recently Destroyed by Fire

Irrespective of creed or nationality, the citizens of Canada were shocked to hear of the burning of the historic Basilica at Ste. Anne de Beaupre several months ago. They will be equally pleased to learn that a finer building in every respect will rise, Phoenix-like, from the ashes of the old one. The design of the new building is shown in the accompanying illustration, which is by the pen of L. N. Audet and J. E. Daoust, architects.

The architectural style of the new structure will be a combination of Roman and Gothic. This style has been chosen largely for practical reasons. If the church were constructed along purely Gothic lines, it would be necessary to give it a height of about 115 feet. With the style chosen, it will require only 85 feet in height.

The new building will be of fireproof material, so that the bitter experience of last year may not be repeated. The main body of the church will be composed of five arched naves with seven bays, or projections, in which it will resemble closely a number of cathedrals in Europe.

The dimensions of the building are as follows: Length over all, 315 feet; interior length, 260 feet; length of the choir, 65 feet; width of the nave, 134 feet; width of transept outside, 192 feet; width of transept inside, 186 feet; height of the grand nave, 85 feet. The area covered by the building will be about 42,000 square feet and the volume will be over 2,000,000 cubic feet.



The Welland Ship Canal—Above, Lock No. 1 looking north. Below, same Lock, general view regulating weir

The Welland Canal Development

Largest Contract Under Way To-Day

Ultimately It Will Cost $100,000,000 and Will Require Nine or Ten Years More for its Completion—A Summary of the Work Accomplished to Date

The close of the 1922 construction season saw a little over one-third of the construction work on the Welland Ship Canal completed. Good progress was made last year on several sections of the work, yet an even greater program of work is planned for execution this year, the government having set aside a sum of $11,800,000 to finance this season's work, whereas the last year's apportionment was $8,000,000. From an engineering standpoint, it is estimated that this work could be completed within the next five years, but it is not expected that it will actually be completed for about nine or ten years, as the work undertaken each year is limited by the amount of money the government can afford to set aside for this purpose. Abnormal prices of labor and material during the war resulted in a temporary suspension of operations, the contractors finding it impossible to operate on the terms of the original contract and the present-day high prices are still materially affecting the amount of work undertaken each year. Yet progress may be said to have been steady during the past few years and the huge contract is fast taking the form of the great waterway that it will ultimately become.

This project, from the viewpoint of size and importance, is the largest engineering contract under way in the world today and is second only to the Alabama Muscle Shoals power scheme insofar as actual amount of money involved is concerned. At the height of the working season last year, a force of about 2,500 men was employed. The ultimate cost will be approximately $100,000,000, though it was stated before starting the work that $55,000,000 would cover the entire construction.

The canal will be 200 ft. in width throughout its 25 miles of length and on completion will enable the large grain carriers to go as far as Kingston, which will mean a considerable saving in the cost of transporting grain to the Atlantic seaboard. Its full value, however, will not be realized, engineering authorities claim, until it has been connected up with a similar system of waterways in the upper St. Lawrence.

Canal Capacity

Provision is being made for a depth of 30 ft. of water on the sills of the locks, although the reaches are at present only being excavated to a depth of 25 ft. Incidentally, it is pointed out that dredging the remaining five feet of depth when desired can be carried out more economically than excavating the full 30 ft. at the present time.

The course of the old canal is followed closely from Port Colborne to Allanburg. The ship canal is at an altitude of 568 feet where it crosses the present canal at Lock 25. It takes a new channel between Allanburg and Thorold, avoiding the irregularities of the present canal. The most noteworthy features of the ship canal are near Thorold, where there are three twin locks in flight, similar to the much-advertised Gatun Locks of the Panama Canal. The valley of Ten Mile Creek is followed quite closely from Thorold to Port Weller. The present canal is crossed at Lock 11, where the altitude is 382 feet.

Construction Details

The new canal will comprise seven locks, a vessel passing through being lowered a distance of 326 ft. from the level of Lake Erie to the Lake Ontario level, the locks being so constructed that they will fill in eight minutes. The total length of time required for a vessel to pass through the canal will be eight hours, it is expected, or about half the time required to travel the length of the present canal. Each lock will lift a vessel a height of 46½ ft., compared with a maximum lift of 26 ft. on the Panama Canal.

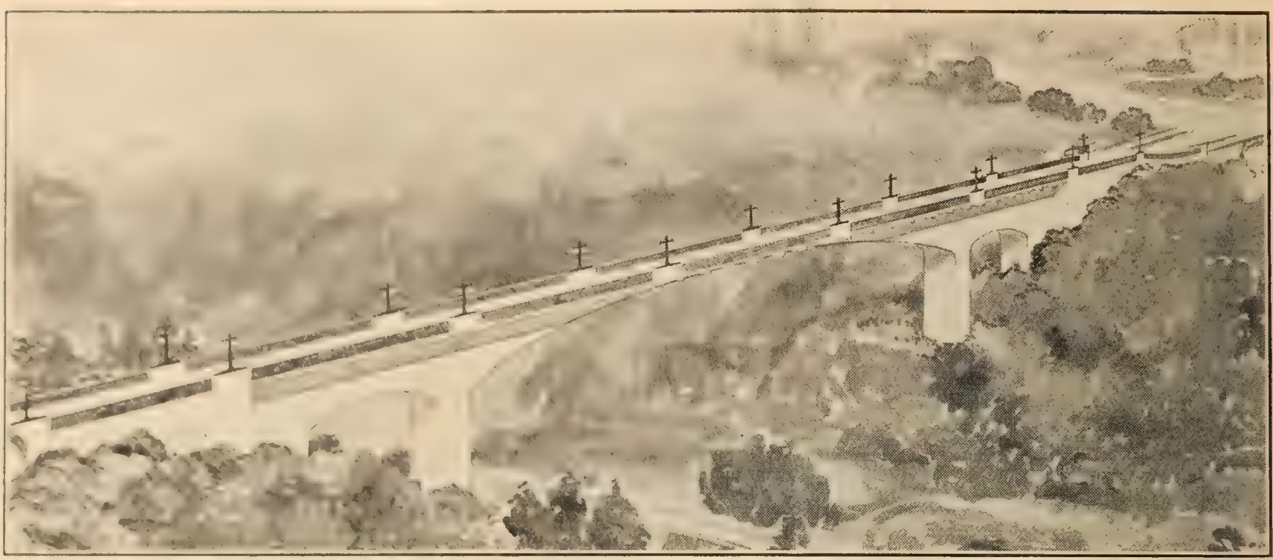
The concrete work is of tremendous proportions. Sixteen million cubic feet of concrete was cast in the locks under construction last year. It is estimated that over half of the huge total of 40,200,000 cu yds. of earth excavation has been completed. The total amount of rock excavation will be 6,740,000 cu. yds., of which, also, a considerable percentage has been completed. The watertight embankments make a total of 2,700,000 cu. yds. of concrete and about 18,500,000 lbs. of reinforcing steel will be used.

This season should see lock No. 1, the Port Weller section, about completed, there remaining only about 10 per cent of the work on this section to be completed. Lock No. 2 is nearly as far advanced and in locks Nos. 3 and 4 the excavating has been partially completed and concreting work will proceed this year. Considerable excavating has been done on Lock No. 5 and concrete work is well advanced on twin lock No. 6 and has been commenced on lock No. 7. The work so far has been on the section from Lake Ontario to Port Robinson, no start having been made as yet on the remaining section to Lake Erie.

Of special interest is the section of the canal in the Thorold district, where the steep descent of the Niagara escarpment in encountered. Within a space of one mile in this section, four of the locks are located, making a total drop of 186 ft.

Gates

The lock gates will be of the single leaf type, swinging on a hinge at one side of the lock and resting in a notch cut in the opposite wall. The lock gates will be 88 feet in length, 83 feet in height and will weigh about 1,100 tons. Side ponds or regulating basins will be formed to fill all locks, thus eliminating objectionable surges and currents that might otherwise be caused by filling from the canal above.



"Governor's" Bridge to be erected over Rosedale Ravine

Structures in Keeping With Toronto's Beautiful Ravines

Four Big Viaducts Included in This Year's Program

Governor's Bridge, Avoca Vale, Humber Valley and Hog's Hollow, at a Total Cost of Millions

The new Governor's Bridge for which contract has just been let by the York Township Council is shown herewith. This bridge was designed by F. G. Engholm and will be erected under his supervision by the Goldie Construction Company at a cost of $100,000. Its purpose is to open up a considerable tract of land on the east side of the old belt line, Toronto, and the cost of the bridge will be borne by the owners of this land. The bridge will closely parallel the C.P.R. bridge over this same ravine, but will be from 100 to 150 yards south of it—between Astley Avenue on the west and Governor's Road on the east. The centre span will be 200 feet and the total length of the bridge will be 672 ft.

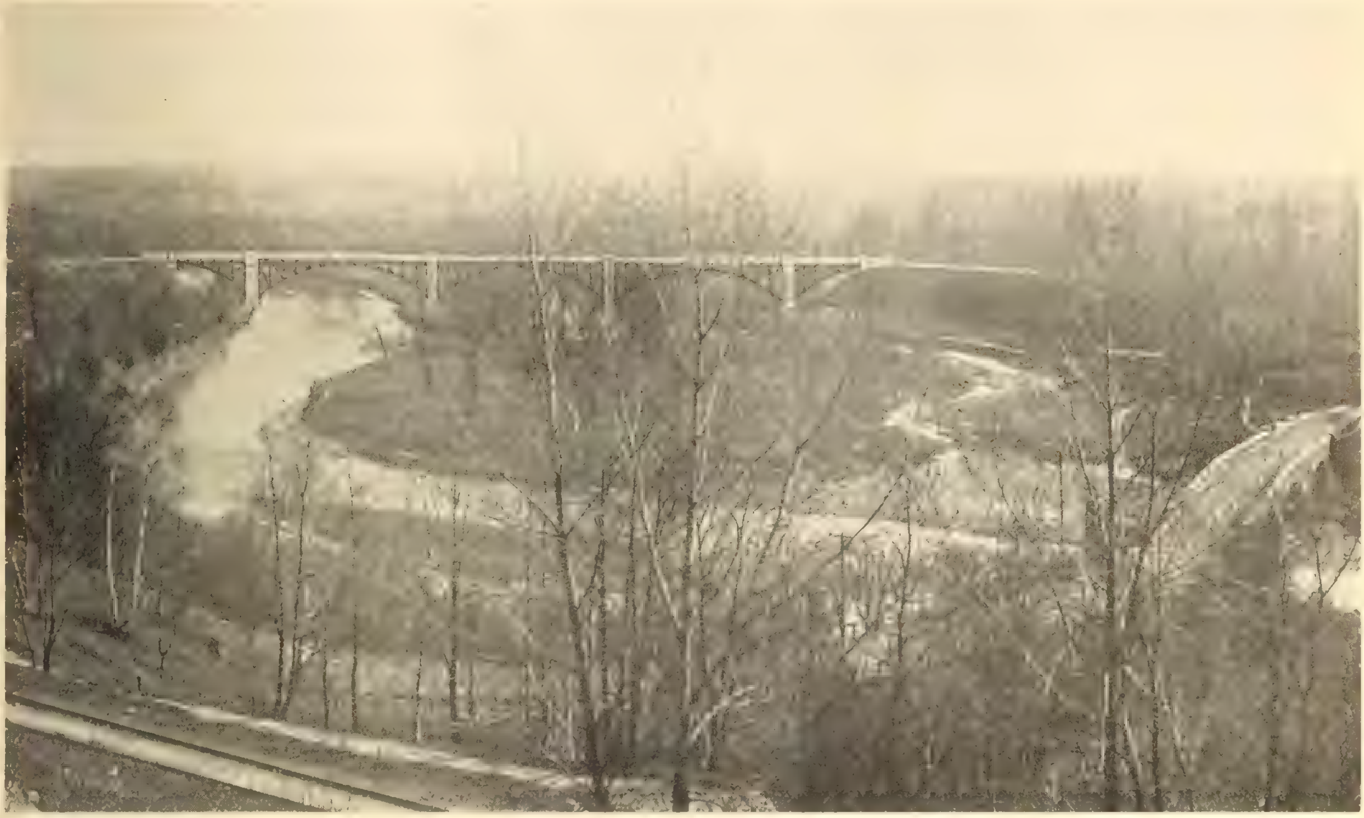
The approaches to the bridge will be 36 feet wide at both ends and the bridge itself will have a roadway 18 feet wide with a 4 ft sidewalk on each side. The sidewalk will overhang on cantilever beams. The general structure is a combination of cantilever and arch with a maximum height of 80 feet.

The parapet walls will be of Milton red rug brick topped with an Indiana lime-stone coping and the concrete throughout will have a special finish. The bridge will be lighted by sixteen electric standards of ornamental type, 8 to a side.

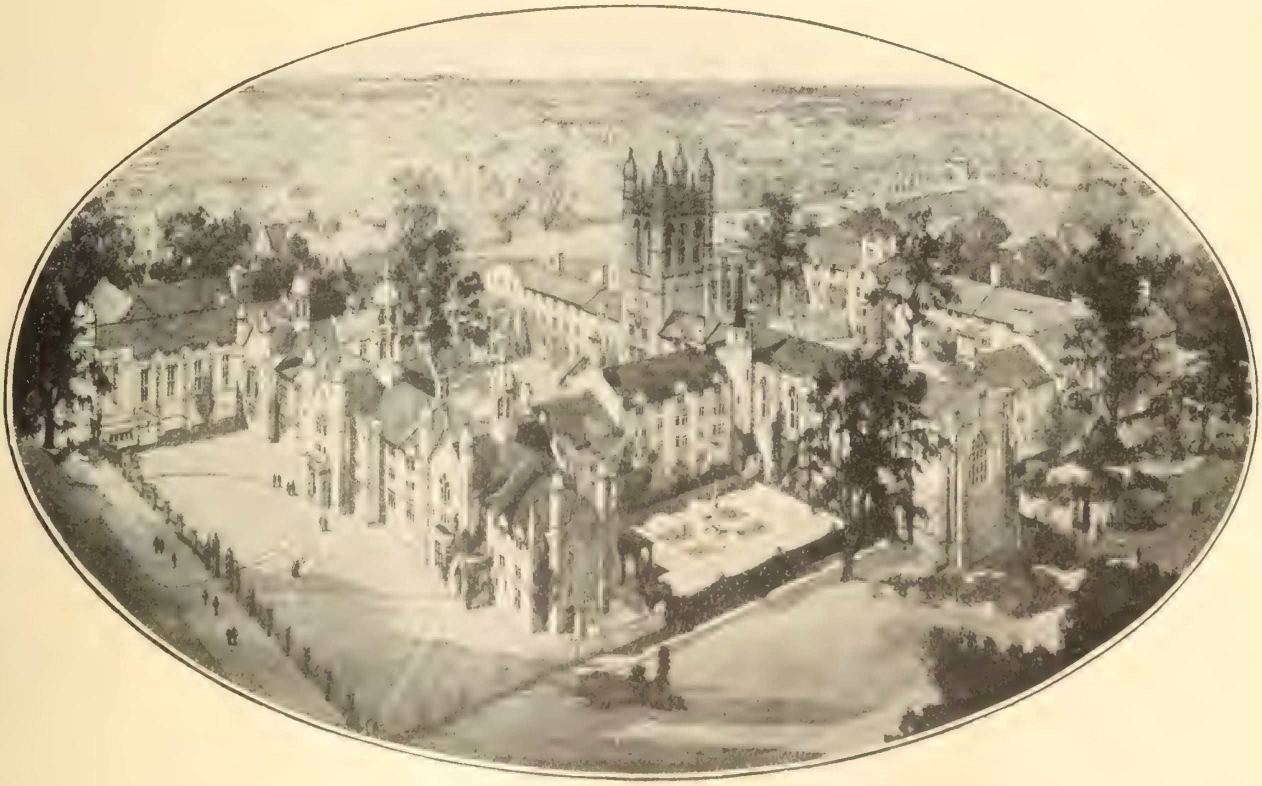
The Department of Highways of the Province of Ontario has been good enough to give us, in the photograph on the next page, preliminary details of the bridge they propose building over the Humber (Bloor Street West extension); also some details of the Yonge St. Diversion Bridge at Hog's Hollow. The cost of these bridges cannot be calculated with any degree of certainty, as the specifications are not yet approved The Humber Bridge practically parallels the well known Stone Bridge by the "Old Mill" a few hundred feet to the south. It will form a connecting link between Bloor Street, Toronto, and a section of Bloor street west of the Humber in York County. The earth approach on the east is already in place. Tenders will be called immediately on alternative specifications on this bridge. It will be 60 feet wide over all—forty-eight foot roadway and two six foot sidewalks— and 820 feet long.

The Yonge Street Diversion bridge will be located west of Yonge and will run in a southwesterly direction, the east end being about a hundred yards from the main road. Its length will be about 1,200 ft.

Another bridge for which appropriations have been made is the "Avoca Vale" structure on St. Clair Ave. East over the ravine west of Moore Park. The cost will be approximately eight hundred thousand dollars. This latter bridge will be built by the city of Toronto.



Bloor Street bridge over Humber Valley; Tenders being called. Old Mill and Stone Bridge seen on extreme right



An early sketch of Trinity University's new buildings on Hoskin Ave., Toronto. Work is under way on section costing $600,000; ultimate cost will probably be between two and three million dollars

Garnet W. Wilson, Architect

Model of Protestant Orphans' Home to be Built Near St. John, N.B.

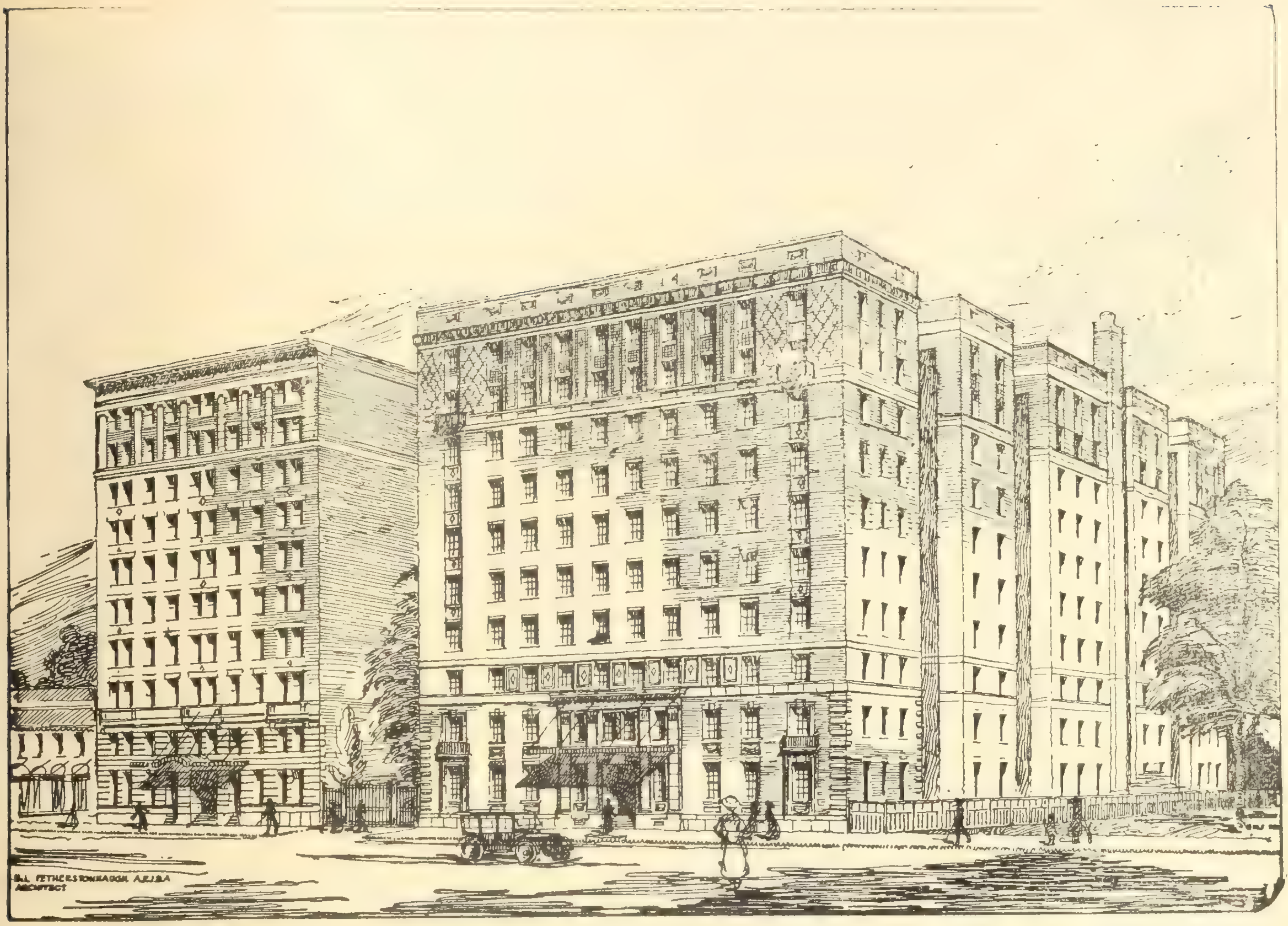
The Protestant Orphans' Home which it is proposed to build near St. John, N. B., this year, was designed by Garnet W. Wilson, architect. The building is two storeys and basement, with the central feature carried three storeys; dimensions over all, 385′ x 151′, the dining room and kitchen forming the centre projection at the rear and the girls' and boys' wards projecting at each end, forming a court in front.

The Home will accommodate 260 children, besides the staff, and includes twelve wards with the necessary auxiliary rooms, kindergarten, domestic science room, sewing room, carpenter shop, tool room, repair room and two play rooms. The third floor of the central feature can be isolated, giving limited accommodation for hospital if necessary.

Construction is reinforced concrete for floors, columns and girders with walls and partitions of hollow terra cotta block. The exterior will be faced with brick laid in Flemish Bond with terra cotta enrichment. Battleship linoleum will be used for the floors of the wards, corridors and large dining room; birch in the class rooms, board room, private room and office; terrazzo in the corridors; quarry tile in the kitchen; and concrete in the basement. The stairs will be wrought iron with slate treads.

Riverdale Technical School, Toronto, is One of the Season's Big Buildings

Riverdale Technical School, Toronto, being erected at cost of $850,000



Drummond Apartments; H. L. Fetherstonhaugh, Architect

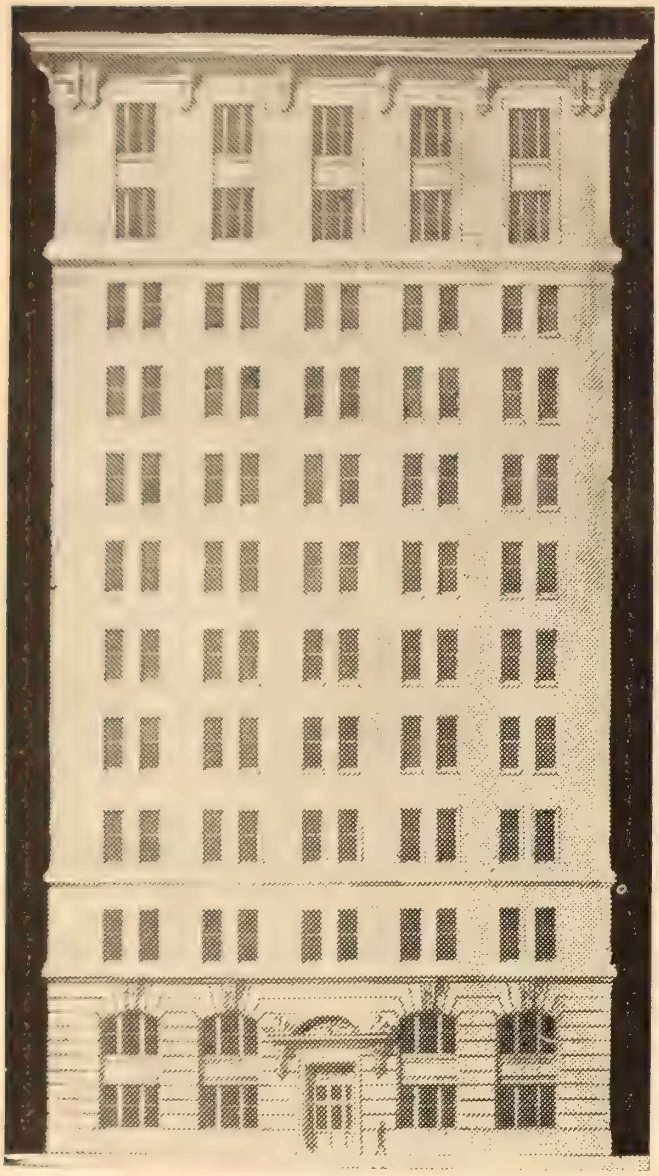
The Largest Apartment House in the Dominion of Canada

Will Contain Two Hundred Suites and be Valued at Four Million Dollars—Anglin-Norcross are the Contractors for the New Extension

The Drummond Apartment Building, between Drummond and Stanley streets, Montreal, is said to be the largest apartment house in Canada. The total value of the property is $4,000,000, of which the building is something over $3,400,000. It is in the heart of the best residential section in Montreal and within easy reach of the principal shopping section.

The building to be erected this summer is an extension to a smaller building which has been occupied for some time. The original property contained 75 apartments, covers an area of 18,396 square ft. and has an approximate cubic content of 1,702,400 cu. ft. The new building will have a frontage of 108 ft. on Drummond and Stanley streets and a depth between these streets of 252 ft. It will occupy 27,216 sq. ft. of land, will have a height of 120 ft. above ground level, a content of approximately 2,700,000 cu. ft. and will contain 123 apartments. The new building will be constructed of structural steel, reinforced concrete and brick, will be fireproof throughout and in every way designed according to the most modern practice.

The building of apartments is making very rapid headway in Canada. Some years ago apartments were much more popular in the United States, where it was not difficult to locate whole sections built up solidly in apartment houses. The idea did not take hold immediately in Canada, however. This addition to the Drummond apartments seems to be another evidence that this type of building is designed to occupy an important place in the home life of our people and it is reasonable to expect that apartment houses all over Canada will be built in very much larger numbers than in the past.



Bell Telephone Company has Big Building Program, Especially in Montreal and Toronto

The Bell Telephone Company have a considerable building programme in prospect for the coming year. In Toronto their new Grover Office is well along and it is hoped that this building will be ready for operation early in 1924. This will be the first automatic exchange in Toronto. The two illustrations on this page refer to the new Elgin Building which the Bell Telephone Company are erecting at the rear of their main office on Adelaide street. This building will have an ultimate height of fourteen stories, but only eight of them will be erected this summer. Photograph below shows a steam shovel at work in the excavation. The general contractors on the Elgin Building are Jackson & Lewis.

The Bell Telephone Company have just announced that work will be started immediately on the erection of a big automatic exchange, to be known as the Plateau exchange in the city of Montreal, to cost in the neighborhood of $550,000.

Every indication points to 1923 being the greatest of building years since the boom days of 1912 and 1913. Contemplated work reported during April by MacLean Building Reports, Limited, Toronto, indicates a tremendous volume of new construction in prospect. The Dominion total for the first four months of 1922 amounts to $164,198,200, compared with $102,603,500 a year ago, an increase of 60 per cent.

Above: Architect's perspective of Elgin Automatic Exchange of the Bell Telephone Co., at Toronto.
Right: Excavation work has just begun.

Road Building Must Go On!

The Highways of the Future

It is Essential that We Anticipate Future Developments Intelligently. The Whole Public, and not One Class Only, Must be Served.

By A. W. CAMPBELL*, M.E.I.C.

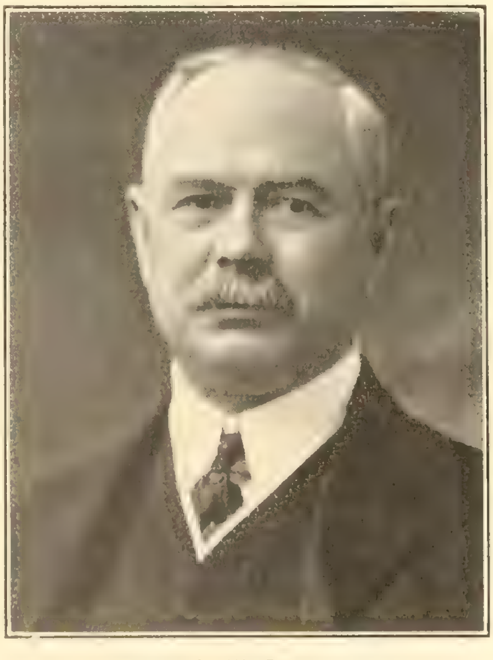
It is a mark of foresight on the part of highway engineers and all who are interested in the good roads movement, to anticipate intelligently future development in the use of this public utility, and in the service it may be expected to be called upon to fulfill in the next generation. The subject of what the future holds by way of improvement in the ordinary roads of this country, is a fascinating and engaging subject of consideration, with a general appeal. All realize that developments must come, having regard to the enormous growth of automotive traffic during the past ten years, and the amazing increase in production of these vehicles from year to year. It is equally evident that road development in Canada has lagged very much behind the increase in this fast moving duty traffic. Without regard to future growth in numbers and tractive power of motor vehicles, it is clear that the next few years will witness, in most provinces, increased activity in highway improvement work, providing the public are to be served.

The "Mud" Crowd

Road building must go on in Canada. A beginning has been made; but, there are reactionary influences at work. There is an element in every province satisfied with conditions as they have obtained in the past. Mud roads have served the pioneer in every province, and this element opines that they should continue to serve the travelling public of today. The mud crowd constitutes the great drawback to reasonable, sane development of the avenues of public travel. It shuts its eyes to the fact that an increasing number of our citizens are looking to the improved highways of the nation, not alone as auxiliaries in commercial transport, but also as a means of enjoying life in a fuller and better way than they have in the past.

The "Permanent" Crowd

There is, on the other hand, another element in some communities, which would have constructed long mileages of what they call "permanent" highways. These people are well meaning, but misguided friends of the good roads movement. Realizing that first class roads are of prime importance in the development of motor transport, and all that this type of highway traffic is capable of offering to the public, many owners of motor vehicles would have nothing but the best in good roads. They do not realize that the building without delay of any considerable mileage of so-called "permanent" highways, would be a very serious strain upon the resources of any governments or municipalities, that no responsible councillor or legislature would survive who advocated putting such a programme into effect at once, and that the reaction of the public from such a programme of development, in Canada at all events, would be disastrous for the time being. A first class pavement costs from forty to fifty thousand dollars per mile. A thousand miles of first class pavement would therefore cost approximately $45,000,000 to build. And, while we speak glibly of road work in terms of millions of dollars, it is now evident that one of the greatest problems before the administrators of highway administrations today, is the devising of means by which such high cost of construction should be borne, as between the general public, whose resources must supply initially the required expenditure, and the operator of highway vehicles; and also, as between the next generation which should be expected to receive service from the outlays involved, and the present generation. Good roads dementia must not be allowed to prejudice the consistent and sane development of public roads in Canada.


Mr. A. W. Campbell

Strike a Fair Balance

Accordingly, it is necessary to strike a fair balance between those who are satisfied with roads as they are now, and those who would gridiron the nation with only the most durable types. The ordinary tax payer is fully alive to the benefit from improved roads, but he hesitates to throw up both hands for a policy of ill-considered development. He must be assured that there will be reasonable regulation of the use of the highways to which his tax money is being devoted. He feels that the truck manufacturer should not be allowed to build and sell trucks, nor the rural motor transport carter be allowed to operate trucks which will, in a few days' time, destroy roads which are, or should be adequate for the purpose which the great majority of operators on our roads are looking for, for years. Regulation of truck traffic should be a condition precedent to the raising of funds with which to construct modern highways. If the public were assured that proper control of the exceptional traffic would be provided, there would be little difficulty in securing approval of the public which pays in providing the wherewithal to improve the roads which are the very stuff of private and community service.

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*Chief Commissioner, Canada Highways Commission.

Many Local Problems

As far as the design of the roads being constructed under direct supervision of the Department of Public Highways of the Province of Ontario, is concerned, there is being paid evident regard to the possibilities of future development in highway transport. Wide grades, well drained upon 4 to 5 per cent gradients are being provided on the provincial highway system of the Province, and on many of the provincial and county roads, toward which the Province contributes subsidies. As far as this Province is concerned, it would seem that the problems to be considered in connection with future development, relate to the pavement itself rather than the sub-surface work. In the selective use of local materials, the tests that experience is showing are desirable upon all materials entering into highway construction and also perhaps, in the adoption of suitable methods to ensure maintenance of the surfaces that must sustain a traffic that is trying upon any surface, in these particulars it would appear that there remain problems to be attacked.

In regard to the selective use of local materials, it appears desirable that more attention should be given to the location of gravel and trap rock deposits in having them analyzed with regard to their suitability for highway work and determination made as to the economic advantage of hauling the materials that may be discovered to the work being carried out, rather than the using of any material that may be at hand. In order to prevent foundations failing from the bottom up and the whole road structure gradually crumbling under the weight of commercial vehicles and their loads, it is desirable that particular regard be paid to the use of the best materials in the surfaces required to sustain this traffic.

Importance of Making Tests

The importance of conducting tests which have been developed, particularly in laboratories of the United States, Bureau of Public Roads and States Highway Commissions, is now becoming recognized more and more. Empiric methods of carrying out road work, are always extremely costly; and, consequently, the use of scientific data wherever this is possible, is a very important economic consideration. In Canada there has been little governmental assistance to experimental work, particularly in connection with highway materials and processes of construction. However, some ground work in this connection has been laid and undoubtedly, the future will show that Canadian resources in this regard may be a distinct contribution to scientific knowledge in this phase of engineering work.

In regard to the maintenance of improved highways, experiments have shown that the wear caused by the wheels of heavily loaded vehicles is very much greater upon roads that are imperfectly maintained, than upon roads where there are no initial elevations from which these wheels may drop and cause large holes. Under modern traffic, fast moving and often carrying large loads, the rapidity with which ordinary maintenance work develops into repair work and even into re-construction, is well known to highway engineers. Accordingly, in order to prevent construction work being discredited, it is advisable that maintenance work should commence the day that construction is finished and be carried on consistently thereafter.

The largest school in Toronto under construction this year is the Jarvis Street Collegiate Institute, shown above. It is 100 x 276 ft in area and will contain 30 rooms. As shown there are 3 storeys and basement. The building is steel, brick and concrete; the contractors Britnell & Company

Canada's Well-being Demands an Answer

Should Engineers Enter Public Life — Dominion, Provincial, Municipal?

Read What Some of the Brightest Minds in the Profession Think About It. Opinions Differ Regarding Individual Effort but Organized Influences Should and Could be Brought to Bear

There is one main question every man who seeks to enter public life should ask himself, viz:—"Can I render useful service? Can I hender better service than any other man who would get the support of the electors if I withdrew?" The question of service, and ability to render service should be paramount.

Unfortunately this is not the basis on which elections are run. Candidates, in the main, do not worry about service—except in their campaign speeches. The main question is "Can I get elected?"

Putting it briefly the two ideas set out in plain comparison are:

1. Can I give better service than the other fellow?

2. Can I get elected over the other fellow?

Having said this we have said a great deal by way of explanation of the absence of engineers in public life. The engineer is one who, both by disposition and training, makes service his ideal. He is deliberate and conservative in his statements, he shuns the limelight, he is concerned with performance rather than promise—an infinitely more difficult matter,—he rates himself moderately; consequently, he does not appeal to the public fancy, for the public is prone to accept men at their own valuation and is always unduly influenced by flowery promises and easy flowing rhetoric.

There can be no argument that a certain leaven of engineering ability among our legislature heads would be desirable. It is conspicuous by its absence. Whether it is something that really can be remedied remains for the future to answer, but it is interesting to know the views held by some prominent engineers themselves.

A few days ago we sent out a questionnaire to a limited number of well known names and have their replies. The questions we asked were:

1. Should engineers enter public life?

2. Why should they?

3. Why don't they?

Our readers will find the answers exceedingly interesting:

Would be Element for Good

Montreal, Que.

Editor, Contract Record:

You have asked me three questions—

1st. Should engineers enter public life?

2nd. Why should they?

3rd. Why don't they?

I have devoted more than forty years to engineering work in its various phases, and have come into contact with a great many men in this profession, and I may freely state that as a class I have found them equal if not superior in intelligence and general knowledge to the average professional man, such as lawyers and doctors.

The engineer's work brings him in direct contact with nature and her laws, and these inculcate a broader view on general subjects, and a desire to be guided by facts rather than by theories or prejudice.

As a consequence of this general rule, I cannot imagine that an engineer would make a satisfactory politician in the sense that we understand it, for he would be inclined to steer a straight course rather than follow the devious though probably the more diplomatic course to reach his ends.

From the standpoint of citizenship, there is no reason why the engineer should not enter public life, but he has a dread of mixing in politics and I fear this is so strong that it would be difficult to pursuade him to do so, but were Government carried on along different lines the engineer would be a valuable aid in a public sense.

As to why the engineer should enter public life—I think there are good reasons. His training has been out of doors. He has had great responsibilities. He could not succeed except he were honorable in his dealings. He has been in close touch with working men as well as men in the legal profession, and also with business interests. These lifelong associations have broadened him out, and as a rule have enabled him to handle most subjects in an intelligent manner. The engineer often has to act as arbitrator in important matters, and this is because of the development of his mind on judicial lines due to his general experience.

Now the question arises: Why do not engineers enter public life? The engineer is naturally of a retiring disposition, and is not an office seeker. He has as a rule had to work very hard during his life and for remuneration below his actual value. As a consequence few are able to lay by enough to render them independent at an age when their experience would be of greatest value to the community. It is to be regretted that this is the fact, because I fully believe that if engineers were in public life they would be an element for good, by diffusing the principles that have been the cause in developing their own lives.

Sincerely yours,
Henry Holgate,
Consulting Engineer.

* * *

Too Busy Getting Bare Living

Saint John, N.B.

Editor, Contract Record:

I have read, with much interest, your circular letter the 20th and recognize fully the force and value of your suggestions.

I will answer your questions briefly.

1. Yes.

2. Because there are constantly questions coming before our Legislatures both Federal and Provincial, of an engineering nature, and the opinion of an engineer as a fellow member would have far greater weight than the same opinion coming from an engineer employed by any party seeking or opposing legislation.

3. Because the class of engineers, whose services as legislators would be of any value, are too busy getting a bare living for themselves and families.

Yours very truly,
C. O. Foss,
Chief Engineer New Brunswick
Power Commission.

* * *

Acting as a Unit

Ottawa, Ont.

Editor, Contract Record:

I have given considerable thought to this question and have come to the conclusion that it is very seldom possible. The only engineers who could enter provincial or federal politics are those engaged in private practice or who have retired, and they are comparatively few. Some of these even would not be elegible because of retainers from municipalities and the others are limited to the larger cities. In this city for instance, there are only about two engineers who would be elegible.

As a unit in different municipalities, that is as a branch of the Engineering Institute, I believe engineers could and should take a more active interest in public questions and command attention to a much greater extent than at present.

Developing along this line would, I think be of greater benefit to engineers in every way.

Faithfully yours,
Andrew F. Macallum,
Commissioner of Works.

* * *

Too Much False Modesty

New York, N. Y.

Editor, Contract Record:

In answer to your favor, allow me to say as emphatically as I can:—

1. Engineers should enter Public Life.

2. Because they are trained, as no other profession is, to make careful investigation of proposed new construction, or reconstruction; to detect gross errors of design or execution; to spend money when it should be spent; and to make the dollar go as far as possible.

3. Too much false modesty; too unassuming; and too apt to concentrate on some detail and leave the real management to others.

The remedy is the education of the engineer.

Yours Sincerely,
T. Kennard Thomson,
Consulting Engineer.

* * *

Must Depend Upon Employer Engineers

Toronto, Ont.

Editor, Contract Record:

Engineers who are in a position to do so should enter public life and assume their share of the responsibility for making reasonable laws in keeping with the best traditions of our forefathers, who fought so valiantly, both with sword and pen, that liberty might live. Engineers as a class are being trained to view great problems from all angles, and are becoming more and more in a position to offer sound advice upon technical and business matters.

Comparatively few engineers can enter public life while we are, as a class, largely employees. I think one who has carefully studied the subject must arrive at the conclusion that we must be represented from those who have established themselves as employers. Men in public life are called upon sometimes to take sides upon questions which become issues during an election campaign. The intense public discussion at such times is almost acrimonious. If a member of a public body, but, at the same time an employee of one of the parties to the conflict, true to his convictions, should cast his vote in the chamber of which he was a member against the interest of the company or organization employing him, the result would probably be disastrous for the employee.

I believe the regulation in force in many organizations forbidding employees to take part in political activities is reasonable, and that we must depend upon engineers who have their own offices to represent the profession before the public.

George A. McCarthy,
Chief of Sewers Dep't.
City Hall.

* * *

Public Has Wrong Viewpoint

Orillia, Ont.

Editor, Contract Record:

Replying to your questionnaire re engineers entering Public Life, I will attempt to give you my opinion in a few words.

1. By all means, yes!

2. There are public questions coming up every day involving engineering which are settled by lawyers and doctors. These two professions due to the stand they have taken in public life have placed their calling on a higher footing with the public by the publicity it gets from their public life.

The engineer has been backward in this respect and the public look upon an engineer as a locomotive or stationary engineer not as a technical man trained to study questions from both sides and all angles.

3. The reason engineers have not gone into public life is due partly to their university training which has been too technical and lacking in English and also that the majority of engineers are employees and therefore their time is not so free.

Yours truly,
R. H. Starr,
Engineer Orillia Water, Light & Power
Commission.

* * *

Engineers Not Public Speakers

Windsor, Ont.

Editor, Contract Record:

In reply to yours of the 20th instant, in answer to No. 1, Yes! Engineers to my mind do not take their place in public life for which their particular training fits them.

As a rule an engineer is observant, very analytical and of executive ability. What better capabilities than these to qualify a man for public life, other than being a politician and, I believe that a politician is born not made.

Why don't they? Too matter of fact and sometimes an air of aloofness that is not conducive to public life. How many engineers will go before the average audience and put their messages across without confounding their hearers as the individual in the "Deserted Village" who amazed the gazing rustics ranged around. The engineering education should include a course in public speaking not to deal in facts and figures but to deal with engineering subjects in the "vernacular" as it were: The Seniors could try it out on the Juniors and Freshmen.

Another point that strikes me is that an engineer does not receive sufficient remuneration or is not usually lucky enough to have the "wherewithal" to give up any considerable amount of time to public life.

Public life requires some sacrifice and sacrifice not only of time but of remuneration and connection with bodies more or less expensive, which can be ill afforded by the average engineer.

Of course there is this,—a man in public life makes connections in a business way which may help, but then when a man is through his public service (usually retired without his consent or will) he is relegated to the has-beens.

Maybe, Mr. Editor, this is too long, but I have felt keenly the lack of appearance of engineers even in smaller public services. The message of engineers is left to a few, and the result is that engineers do not occupy the pedestal in a community that I believe they should.

Yours truly,
M. E. Brian,
City Engineer.

* * *

Most Acute Minds Rarely Enter Politics

Toronto, Ont.

Editor, Contract Record:

I have your favor of the 20th inst., with reference to the desirability of engineers entering into public life.

By this, I understand that you refer to the election of engineers as members of the Dominion or Provincial Houses of Parliament. My reply to your questions would be as follows:—

1. Engineers are not likely to enter political life in large numbers. There are several other lines of employment which qualify men much more effectively to obtain that support at the polling booths, which is essential to securing entrance into political life.

2. I do not think it desirable that engineers as a class should enter political life. A very great proportion of the disbursements of public moneys are made on works which of necessity are placed in charge of trained engineers, and I think that a larger proportion of the engineering profession will be found in public employment than is the case with any other line of occupation.

As the control of the disbursements of all these public moneys must be placed in the hands of engineers it is more desirable to make sure that the staffs of the great public departments shall be made up of fully qualified engineers tion that these same fully qualified men should find a place in the legislative bodies whose action places public funds in their control.

3. Entrance into political life is mainly a personal matter and one which calls for a very large amount of personal time and attention. It is fairly certain that the man who gives his time and attention to the maintenance of his political position will be unable to devote a great deal of time to the maintenance of his technical position, and is, therefore, not likely to qualify into the first rank of professional engineers.

The politically active engineer would also be debarred by reason of his political alliances from rendering much service of important character in connection with public undertakings. The opinions and views of such an engineer would undoubtedly be considered by the public to be influenced by party expediency.

The engineering profession dealing as it does with matters of fact and measurement is not nearly so closely allied to political life as is the profession of law, but we find that the most acute minds in the legal profession rarely aspire to positions as members of Parliament, and that such men do not actively enter political life unless they are tempted by offers of assured positions such as that of Minister of Justice or Attorney-General.

Yours very truly,
J. G. G. Kerry,
President Kerry & Chace Ltd.

* * *

Too Constantly "On the Job"

Vernon, B. C.

Editor, Contract Record:

Answering your enquiry on the above topic I would submit an opinion as follows:—

1. Engineers should undoubtedly be encouraged to enter public life; their training and executive ability is as essential as that of the accountant and lawyer; where public works are to be considered, the view point of the engineer is all important to save careless use of public funds as he is fully able to diagnose methods of construction.

2. The engineer of today is no longer simply the hired man "Who makes the wheels go round." His training not only fits him to control the "means to the end," but he can be as capable in an executive position as executives trained in other spheres of activity, and may be more so through having natural constructive as well as directive ability.

3. To my mind the reason engineers do not rush into public life is that they are usually very busy men and constantly "on the job," not only taking care of matters of immediate concern but also visualizing and preparing for the requirements of their charges for weeks, months or years ahead according to the responsibility or degree of those requirements, in short, their job is unending and they cannot leave it. Engineering being a science requiring analytical and mathematical education for the contest with material Nature and calling for the closest concentration and isolation for clear thinking, it follows that engineers as a type are not likely to shine as orators; they think unspokenly and cannot be loquacious and eloquent in speech, and usually hug the studied atmosphere of the library in preference to the temporary brillance of the public platform.

Engineering calls for slowly developed conclusions, grit and staying power of the highest order to compete with material Nature.

The engineer is therefore at a disadvantage with those who are able and trained to think fast and lightly.

Cut out the plodder who unostentatiously controls the elements of time, space and mass from his chosen field of activity and allow him to assist in the direction of Public Affairs with the idea of efficiency always before him.

S. H. Excell.
City Superintendent.

* * *

Salaried Men Not Eligible

Winnipeg, Man.

Editor, Contract Record:

I have your letter of the 20th. instant and take pleasure in answering your questionnaire with respect to engineers entering into public life.

(1) Should engineers enter public life? Yes!

(2) Why should they?

(a) Every man should give a certain amount of his life's labor in the interest of public service.

(b) All progress in the inter-relations of mankind require a considerable engineering effort.

(3) Why don't they?

Engineers come chiefly under the classification of salaried men and it may be generally conceded that our present commercial system does not permit of a salaried man entering public life. He has practically sold his entire labor, mental and physical, to the corporation which employs him and he is usually restricted in the free exposition of the judgement which his conscience dictates.

Yours truly,
J. W. Sanger,
Chief Engineer, Hydro-electric System.

* * *

Needed in all Public Discussions

Ottawa, Ont.

Editor, Contract Record:

Referring to your letter of 20th, I may answer your questions as follows:

1. Should engineers enter public life?
Yes, undoubtedly.

2. Why should they?

The engineering profession has been to some extent in the background in public estimation in comparison with other learned professions due to the almost general custom among engineers of effacing themselves. It is time they should take the place that is their due in the view of the public.

Their training and experience fits them particularly to handle the many questions that come before public bodies in a more practical manner than they can be by the average legislator who is a lawyer whose training has been on entirely different lines. I think that no one class or profession should fill our legislative halls; but an admixture of engineers, lawyers, merchants, farmers and manual workers would make the ideal parliament. The engineers could contribute as much as any other of the classes named to the excellence of the work done.

3. Why don't they?

I do not know why engineers are so shy of public life. There must be something about their experience that makes them averse to standing in the limelight but we know that as a rule they do not seek the high places. Possibly their lack of training in public speaking, concentration on the problems that they continually have to face, which leaves them little time to study politics, are reasons why they do not take their place in public life.

The Engineering Institute has done considerable work in making engineers realize their worth and the need of their taking their rightful position in public life, but there remains still much work to be done in that direction.

Specially is the engineer needed in the commissions which our Governments appoint for various specific purposes, but usually they are left out and the men who are appointed on these commissions pay engineers to advise them on the technical matters which often come up for discussions.

We are living in an age where Applied Science has assumed very great importance and the advice of the technically trained man and his point of view are needed in all public discussions.

Yours very truly,
A. A. Dion,
General Manager, The Ottawa Electric Co.

* * *

Must Have Funds and Leisure

Chatham, Ont.

Editor, Contract Record:

It has been remarked many times in past years that our Houses of Parliament rarely held any representatives from the Engineering Profession.

The writer believes that no doubt exists in the minds of any thinking person that trained engineers would be valuable additions to our governing bodies and would benefit the country as a whole as well as the engineering profession itself.

The great difficulty in the way of securing representation of engineers is the indisputable fact that the success of our best engineers is based on the knowledge by the public that politics do not enter into decisions given by them.

The work of the engineer is usually closely connected with something for which the public are paying. The decisions of the engineer may vary the cost of the work. They must be free from any political influence and be given on the engineering merits of the case in point. The decision of an engineer who is noted as a successful politician and is also practising his profession may not be relied upon from the point of view of the public.

The only way the writer can see that engineers may generally enter public life without hurting themselves in their profession through strong party affiliations is to have sufficient funds and leisure of time to take up politics as an increased sphere of activity. Unfortunately the majority of engineers have not yet reached that happy stage in life.

I think the above are several good reasons why engineers don't enter politics as much as we all would like to see the engineering profession better represented.

Yours very truly,
C. H. R. Fuller,
City Manager.

* * *

Engineering is an Exact Science; Politics Isn't

Saskatoon, Sask.

Editor, Contract Record:

Inasmuch as it is necessary to have governments composed of representative men of a country, it therefore must follow that civil engineers along with other professional and business men should take their place in these governments. The above statement I believe answers your first two questions; but the third requires a somewhat lengthy answer.

The duties of a civil engineer, particularly in the early stages of his career, usually take him long distances away from the more populous communities. His circle of acquaintences and friends is limited to those engaged on a similar class of work to his own or to those who are carrying out the work of which he is in charge. When he does eventually get located where other people live he is usually an official in some large corporation and the time when he could have entered public life with some advantage to himself has passed.

Looking at the question from another angle the percentage is small in the case of engineers where they are in business for themselves. They are usually employees dependent on a salary check and not many of them with whom I am personally ecquainted can afford to miss many of those checks.

Then again a member of any government must be elected; or such is the case in this country. In order to get elected a candidate must deliver speeches and make promises. In the great majority of cases he neither fully believes what he says nor has he any great faith in being able to fulfil the promises. I have heard the average engineer many times try his hand at giving public addresses but with the exception of some isolated cases he makes a poor fist of it. Even among his own crowd he prefers to read papers. This does not necessarily mean that he finds it hard to express himself. On the other hand I know of no class that can be so expressive. I would say that most times he is too explicit to ever make a good politician.

Engineering is an exact science and those engaged in it come in time to model their doings in a more or less exact and matter of fact manner. It is ludicrous to imagine the engineer candidate for election promising his constituents from the public platform that although test has proved conclusively that the permissible fibre stress on any well known construction material in common use is only ten thousand pounds yet if he be elected he will immediately see that this is raised to twelve.

Yours truly,
Geo. D. Archibald,
City Engineer.

* * *

Distasteful to Engineers

Amherst, N. S.

Editor, Contract Record:

I am pleased to accept your invitation to express briefly my views in regard to the desirability of engineers taking part, more widely that at present, in the Government of our country.

My idea is that a parliament to be successful should be composed of experienced business men of various classes including merchants, manufacturers, farmers, engineers and a few lawyers and broad minded men from the ranks of labor, men who would represent all these classes of the community.

Engineers would , I think, be of great value because of their training and experience in the arts and sciences which have such an important place today in our industrial organization, the building and operation of railways, highways, mines, hydro-electric plants and even agriculture, which is the basis of all our industry and prosperity.

The practice of employing engineers or combined engineers and business men as managers or controllers of cities and towns is increasing. As a matter of fact, there is no line of work in which it is not found necessary to employ engineering knowledge and experience.

You ask why engineers do not enter public life? I believe that as a rule public life is distasteful to engineers because of the waste of time in our parliaments by members who are not trained to confine their efforts and their speech making to important matters of public business, and the political game is not always straightforward or clean, but it seems to me that if the electors were wise enough to bring forward and elect men of this class, and if when elected as members of parliament they were associated with other prominent men who were willing to serve their country, not for what they could get out of it, but for the advancement of the country as a whole, there would be found engineers who would be willing to do their part in public life, and I believe the influence of such trained engineers would be beneficial to our parliament and the country as a whole.

Yours truly,
D. W. Robb,
Manager International Engineering Works.

* * *

Vision and Personal Probity

Lethbridge, Alberta.

Editor, Contract Record:

I have yours of the 20th and offer the following:

I certainly think engineers should enter public life.

An engineer must have vision—he must be able to visualize the whole from the very beginning and he must be able to go into details; then engineers as a tribe have the best possible record for personal probity.

It is largely through the lack of these qualities that the difficulties all our governing bodies are facing today have been created.

An increasing number of engineers are finding their way into public life. An engineer must get down to bedrock-facts—dollars and cents—and does not develop a politic mind. An engineer is so absorbed in his work he is never through and does not naturally get in the pathway of opportunity for public life.

The more intelligent our people become, the more they are going to look for men for public office with the foregoing virtues—and faults.

Yours truly,
H. W. Meech,
Commissioner of Public Works.

* * *

Public Don't Seem Anxious

Vancouver, B. C

Editor, Contract Record:

Should engineers enter public life?—a question that from an engineer's point of view, at least, can be answered unhesitatingly in the affirmative. **They should.** For a good many years now, in professional gatherings and clubs this question of "recognition" of the profession has been very much to the fore—one may hear it discussed in such gatherings from end to end of the country. And always the conclusion is the same—among engineers—they **should** be more in public life.

But a side of the question not so often touched upon is the fact that there does not by any means appear to be the same anxiety on the part of "the public" to invite the engineering profession to such places of influence and authority as we, the engineers, feel we could fill to such advantage. There must be some good reason for this omission, for invitations of this kind come quickly enough, and often unsought, where a man or a class of men is admittedly "useful" in public affairs. That such admission of usefulness is not accorded to our profession in at all such a general sense as it is to the legal and business fraternities is indisputable, and it is evident that if it is ever to be so accorded it will be only because of proven ability and worth in this particular field.

Why is it not expected of every man in the profession that as an essential part of his training he become an efficient public speaker? This is an ordinary requirement in other professions whose duties are no more service to the public than our own. That we must have to start with. Then every branch society or group of engineers anywhere could become the missionary centre that every political association now is, with the great advantage that these methods would be employed from a substratum of training and judgment with specialized knowledge of those questions of engineering import which after all form so large a percentage of the business of the country. With a country wide organization of this kind no question of importance could pass without concerted and efficient action—by means of letters to the press, participation in public meetings, by the calling of social meetings, and all the other well-known and tried expedients.

In a word, we have before us the necessity of convincing a sceptical customer, not too well satisfied with present conditions it is true, but requiring substantial assurance that we can do better and give more satisfaction. The public is quick to recognize a new voice, provided always that it is interesting enough, and loud enough, and insistent enough. The lack of these three qualities is the reason why engineers, as a class, are not entering public life to the extent which their real ability, in the mass, justifies.

J. B. Holdcroft,
Hydraulic Engineer,
Pacific Coast Pipe Co.

* * *

Emphatically They Should

Vancouver, B. C.

Editor, Contract Record:

I am in receipt of your letter of April 20 asking my opinion with reference to engineers entering public life and I would say in reply most emphatically they should.

I believe an engineering education, coupled with a sound business training, is the most logical foundation upon which to build leadership which will be required to guide the destinies of a country, the future of which is so dependent upon the proper and economical development of its immense natural resources.

In my opinion it is just as essential for the minister of public works, Federal or Provincial, to have an engineering training, coupled with business and executive ability, as it is for the attorney general to have legal knowledge or for the head of the department of health to have practiced medicine. The minister of public works who has not had an engineering training does not fully realize the wastefulness of so-called cheap construction and the disastrous results of unsound engineering propositions, and may, through ignorance if for no other reason, allow political expediency to be the deciding factor in connection with public works involving large expenditures, whereas the, engineer whose training and experience gives him a clear vision of what the ultimate costly result or failure of unwise construction will be, will hesitate to let such influence affect his judgment. A minister of public works may receive the very best engineering advice available, but not realizing the seriousness of the problem involved may give such advice second place to other reasons at the urgent request of his collegues in whose eyes some political objective looms large.

I believe there are at least three reasons why engineers do not enter public life.

First, remuneration of engineers as a whole is such that few can afford to go into politics and few members of the profession are prepared to take such a step and depend upon political sources for the extra funds necessary to live upon.

Secondly, and this possibly applies more particularly to the West, governments and municipalities are controling engineering works more and more and all engineers employed by governments,—Dominion, Provincial and Municipal—are automatically eliminated from the political field.

Thirdly, the engineers' training in the past, much of which has been in outlying districts, has developed him along individual lines at the expense of the broader community spirit. As a rule he is a poor mixer and not well known to the public at large and the latter is necessary to win success in the field of politics. Again, as a profession, engineers are poor public speakers, and public speaking is becoming more and more essential for success in public life.

Engineers no doubt in increasing numbers will become connected with industries which are closely allied to engineering and will attain to positions of executive responsibility. The education, training and experience secured in such a field will best fit men to guide this country through a period of development of its wonderful natural resources. Such a field should be the most fertile and valuable for producing the type of leadership which we require at the present itme.

Yours very truly,
A. E. Foreman,
Portland Cement Association.

Alberta and Its Relation to Industrial Canada

What is the Solution of Central Canada's Fuel Problem?

Winnipeg has Been Converted—What will be U.S. Attitude When Next Shortage Occurs?—Intimate Study of Coal Situation Favors Use of Our Own Fuel

By GEORGE R. PRATT*, A.M.E.I.C.

Fuel conditions in Canada during the last few years have brought to public notice the vast resources of coal which lie in the Province of Alberta.

To date this resource has only been scratched, in a more or less haphazard manner. What development work has been done has been upon a very wasteful basis. Obtaining coal lands and leases has been too easy, and money has been put into the development of these lands without sufficient consideration as to the probable earning capacity of the money expended.

Proper business methods are as necessary in opening up coal mines as in any other class of manufacturing. But to date in the coal industry, investigating where the market would be for the coal which they proposed to produce has been the last consideration of the prospective coal producer. This may be due to the fact that in most cases the parties going into the business were inexperienced in the "coal game." Naturally it requires that experience be bought, same as in any business. The result, however, is that this unnecessary development makes it unprofitable for those who have gone into it as a business and have put in equipment for production upon a business basis. It means that more than half the time the mines are entirely closed or are operating casually at net loss.

New Market Essential

It also seems that when a new market is opened up representing a small or large tonnage that it is taken as justification for new development equal to twice or more the increased market tonnage. That market extension is necessary to take care of the existing development, is lost sight of by the newcomer.

The production of coal in Alberta last year was around six million tons, but the production could have been around fourteen million tons had the market existed, without opening up more mines.

The above answers one question why the cost of mining coal in Alberta is as high as it is.

Action by Alberta Government

About three years ago the Government of the Province of Alberta realized that if the coal was to become an asset instead of a liability, that they would have to interest themselves in finding markets for the coals which it was hoped to produce. It was found that under the existing methods of competitive marketing that extensive advertising and propaganda work by the individual mines reacted to increase the cost of the coal and so destroy the object of the advertising. It was also found that mines which neglected the quality and preparation of their coal took advantage of the advertising of the better coals and were able to sell so-called coal at lower price. These combined had the effect upon the public mind caused by the demonstrated proof that the coals were not satisfactory and unsuitable for the purpose.

Government bureaus for market extension are not new but no record could be found where any government bureau demonstrated in a practical way the values of, or the methods of using, any particular product, so that the method which was proposed was more or less of an experiment.

In order to counteract the belief that the Alberta coals were not suitable for practical heating and steam requirements, a building in the downtown district of Winnipeg was equipped with the various kinds of domestic heating equipment, as they were in existence in the home of the householder. No changes were made to the equipment as it was desired to show that results were possible without expense for special furnaces. A combustion engineer was placed in charge and all of the various kinds of coals from the different fields were demonstrated in practical ways to the public who applied for instruction.

Mr. G. R. Pratt

What Happened in Winnipeg

The result had been that, in less than three years, Winnipeg and the West has been changed from anthracite to about 90 per cent Western coal for domestic purposes.

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*Fuel Engineer to Alberta Government.

In addition to practical demonstrations a special educational work has been issued under the title of "Coal Truth," which covered the methods to be used in handling the various coals, giving pointers for improving heating appliances and best methods of making installations.

Instruction has also been given for best means of obtaining economy and service on steam plants, and during the same period about half of the coal imported for steam purposes has been supplanted by the Western coals.

The demonstration plant is equipped with a protection lantern and several hundred slides have been made up showing all classes of equipment for any service. Where possible these slides have been colored to better demonstrate the action of the fuels in the particular equipment.

Educational work has not been confined to the coal consumer. The coal dealer and producer have been kept advised of improved methods and the best methods of adapting their product to the particular market.

In the short time that it has been in operation many millions of dollars have been saved to Canada that would otherwise have been sent abroad for fuel.

Can Be Done Elsewhere

The fact that the Alberta domestic coal has superceded anthracite in Winnipeg, demonstrates that what has been done in one place, against opposition, can be done in others.

Some of the objections raised at the start to the Alberta coals were:—

1. That all existing heating equipment must be scrapped on account of unsuitability.
2. That the coal would require too much attention.
3. That it would not keep in for long periods.
4. That it would create a smokey and dirty city.
5. That it would be a danger to life due to gas in the house, and chimney fires.

At the end of the three years of test the public have demonstrated that the objections are not only not facts but that the risks are less than with the anthracite coal.

One objection which was made much of at the start was that carrying coal so far East as Winnipeg was not ecomocically possible for the railroad, and that Winnipeg would suffer at times when coal could not be transported. This has been proven a myth and has been a very profitable business for the railroads.

Sufficient For History

In as few words as possible the above is an outline of what conditions did exist and the conditions which now exist. You may extend the number of words and make an interesting novel of the campaign but this is sufficient for history.

Now to make an analysis of the result.

First, who has suffered by the change?

The individual purchaser cannot have lost money; the change has been made in commercial competition with the imported coals, so that it must have been profitable to him, otherwise he would not have purchased such coal.

Second, he could not have suffered in service, otherwise he would have purchased the other coals in competition with the Alberta. The anthracite has always been available and of good quality regardless of the shortage in the East.

Alberta has not suffered.

Has the Dominion of Canada suffered? There is no indication of this. There was no duty on imported anthracite. Has the money which has been kept in this country been a disadvantage? Has it caused any loss to Eastern manufacturers? Has it destroyed work for citizens in Canada?

Everything which exists, or is done, must have an opposite; there is no mean. If the answers to above questions are No, then the final result must show a profit.

Apply now the same logic to Canada as a whole. Consider Canada's fuel problem as Canada's problem. What are the outstanding features that require consideration?

The United States Attitude

The United States is gradually using up its anthracite coals. The population of the U. S. is increasing and making greater demand upon the anthracite coal. Public opinion in the U. S. is unfavorable to exportation of anthracite coal to Canada. Public opinion in the U. S. is becoming aware that Canada has suitable domestic coal within her borders. The shipment of anthracite coal to Canada is only due to business economies of the coal producer. It acts as a stabilizing market on costs of production.

During the next coal shortage, will the official viewpoint in the U. S. be that anthracite is a necessity to Canada, or will it be considered merely a matter of convenience? Will the U. S. consider that the geographical location of the coal fields of Canada is Canada's problem alone, or will it be a party to the problem by permitting its citizens to suffer during coal shortages?

You cannot answer the above questions by referring to statistics. Look at and study them from a common sense standpoint and answer them for yourself.

From a Dominion Viewpoint

Now look at it from a Dominion of Canada standpoint. Canada is now at Hesitation Point as to whether it shall boom or slump. In either case it means increased purchases of manufactured products from the U. S. This is indicated by the present boom in the U. S. A study of the activities there show that the activities are preparatory expansions for increased production of manufacturers.

Again, study such conditions from a common sense standpoint. Where are their markets for the goods which they must produce if they make use of the preliminary expansion in hand at the present time? They cannot sell in Europe against the high value of their money; they cannot sell to Britain while she is paying off her debt.

Canada will be the logical place where they can dump their manufactured goods at low prices. This should start an industrial boom in Canada, if Canada has the money to spend. The spending money must come out of the inherent resources of the country, not from increase of borrowing, which would mean increased taxation.

Coal is a Bank

Consider coal as being a Bank of stored wealth, which it is, to dip into when necessary. Every dollar's worth of coal which is produced in Canada is a dollar saved to Canada. To purchase manufactured goods and to purchase raw material such as coal, situated such as Canada is and will be, is economically impossible. It may be that attempts will continue to do the impossible but the longer it does the harder will be the jar at the bottom.

Canada should use the same business horse sense that you or I expect from any concern doing any business. Buy or borrow as little as possible and turn out as great an output as your internal resources or equipment will permit.

Suppose you had made a complete study of the coal situation and were asked your opinion as to why Canada imported Coal? Taking everything into account, your only answer could be "because it was 'thought' that U. S. coal was 'nicer' than the native coal, and that Canada did not know what her resources in coal amounted to, nor its value, owing to lack of enterprise by the Provinces which have the coal resources."

Can't Have All the Good Things

Central Canada is unfortunate in not having native coal, but comparing central Canada with other parts of Canada, can it say that it is commercially in an unfortunate position. No person nor country can have all the good things of life without making some effort to obtain them. With regard to coal there are three things which central Canada must consider on account of its lack of coal. It must either pay the cost of obtaining the coal which it requires or prevail upon Canada as a whole to pay part of the cost of providing coal or be prepared for the gradual movement of the industries to the cheaper fuel areas.

This latter is reasonable if looked at from the reason as to why the industries happen to be there, it being due to the cheap fuel which they obtain from across the line.

Eastern Canada is the logical base for the supply of steam coals for Ontario and Quebec. Eastern Canada is the logical base for the supply of domestic coal for Quebec, probably in the form of coke and gas, if the price of converting it will compete with the raw coals from Alberta. Alberta is the logical base for the supply of domestic coal for Ontario, if it can be transported at a time when rolling stock and rails are idle.

Rail Haul not Unprofitable

On paper it might be shown that the haul from Alberta to Ontario is unprofitable, but this is not the case from a natural point of view, providing that the price obtained for transportation exceeded the cost of purchases outside of its borders for the operations made necessary for its removal from one point to the other.

Even were such the case, providing that the cost were less than the imported price of the coal, it would still be a saving to Canada as a whole. For instance, suppose that all of Canada's purchase of 120 millions of dollars in coal was produced in Canada and it cost sixty millions for purchase of commodities outside to produce this, Canada would still be sixty millions in pocket.

In the campaign put on by Alberta for a coal market in Ontario the objections raised have been—

Alberta's Interest

That Alberta has a "selfish" interest. This word "selfish" should be changed to "self interest," and applies to all enterprises. Most individuals, collections of individuals and countries are in bad straits today simply because they are looking to some other body to help them out. If all would do as Alberta is doing—creating work for its own citizens—there would be less time to worry about what the other fellow was doing. Let every one selfishly put his own house in order and there would be none to complain.

The second objection that is raised is:— "Why should the whole of Canada assist Alberta? Because Alberta's fight is Canada's fight and it is prepared to use as much energy in putting the Eastern steam coals on the Ontario market as it is its own domestic coal. When considering the profit, consideration must also be given to the fact that the mining cost is only part of the manufacturing cost of coal. The freight cost is distributed over all Provinces.

The Dominion fuel question requires organizing upon practical lines at once, not left to labor alone as has been the case heretofore. Look for reasons why you should use your coal resources. It has got to be done, and you might just as well start now as later. Fuel is the basis for prosperity in any manufacturing nation. Increased industrial activity will also assist in finding a place for the thousands which are turned out of the schools and universities every year and so make their migration to other countries unnecessary. The economic waste of this is worthy of consideration with the coal problems.

New Roads for Northern Quebec

The government of the Province of Quebec has definitely decided to open up road connections between the Canadian National (National Transcontinental) Railway line and the northern part of Temiskaming County, where important gold discoveries have recently been made. Surveys in connection with the proposed roads were conducted last winter and their construction will be proceeded with without delay. The accompanying map shows the location of the territory which the new roads will traverse. The map also shows the location of the Quinze River water powers, which the Quebec government has recently leased and which are to be for the benefit of the mining districts of the north.

One of the proposed roads will run south from Makamic, a point on the C.N.R., as far as about the centre of the township of Rouyn. A second road will run south from Villemontel to the same township and closely following the navigable Kinojevis River. A third but shorter road is also mentioned to run from Palmarolle to Lake Duparquet, where prospecting activities are also expected. Shorter or branch roads will likely be built east and west from these two main roads. Although the work of the building of these roads is going to be started immediately and pushed ahead with all possible diligence, it is not expected that they can be completed before the end

Fatigue of Metal

"An Investigation of the Fatigue of Metals" is the title of bulletin No. 136 issued by the Engineering Experiment Station of the University of Toronto. It deals with an investigation conducted by the Station in conjunction with the National Research Council (U.S.), the Engineering Foundation and the General Electric Co.

The Best Practice The World Over

Modern Trend in Sewage Disposal

A Comprehensive Review of Methods and Results—Every Case on its Merits but the Activated Sludge System Receiving Much Consideration

By Lt. Col. GEO. G. NASMITH*, C.M.G., Ph.D.

In the last few years there has been a great advance in our knowledge of the art of sewage disposal and, as has almost invariably been the case in the past, most of the developments have occurred in Great Britain. During the war in England the activated sludge process was proved to be a successful practical method and since then there has been a decidedly increased activity in the problem of economically disposing of human wastes. In Great Britain particularly, partly because of economic necessity, there have been widespread efforts to obtain greater efficiencies from existing sewage disposal systems.

As a consequence in England sprinkling filters are being renewed and tanks of various sorts are being converted into activated sludge plants. Already in the activated sludge process the Manchester type of tank, with air diffusers placed on one side of the tank only, has replaced the original type where the aeration plates were distributed over the whole of the tank floor. Many efforts have been made in England to eliminate aeration plates altogether and substitute some mechanical method of aeration as by rotating paddles at Sheffield (1) or by a rotating cone as at Bury (2). So rapidly is this process developing that Imhoff tanks constructed at Chicago (3) are arranged so that they may be converted into activated sludge tanks if desired at some future time.

A few years ago there were comparatively few engineers who understood the principles underlying the processes of sewage disposal. At present there are numerous scientific men as well as engineers extremely interested in these questions and, as a result of numerous investigations by chemists, biologists, bacteriologists, entomologists and physicists, a great deal of scientific data has recently been accumulated which bears directly on the problem which engineers are endeavoring to solve. In fact, much light has been thrown upon the causes for failures in sewage disposal and in many cases it has been possible to make unsuccessful plants work satisfactorily by the application of the newer knowledge.

If we take a general view of the field of sewage disposal we see that the contact bed which never really took hold in America has practically disappeared in Great Britain, together with the chemical precipitation process, while the combination of sedimentation tank and sprinkling filters is there being operated much more satisfactorily. In England separate sludge digestion, as at Birmingham, (4) has proved successful on a large scale. In America, too there is a marked tendency to combine sedimentation with separate sludge digestion because the process is more flexible and there has been a good deal of trouble with Imhoff tanks. In both countries the activated sludge process is rapidly developing.

With a clearer conception of the very close relation between sewage disposal, cleanness of surface waters and filtration of public water supplies each sewage disposal problem nowadays is one to be decided on only after mature consideration of all the factors by which the health and comfort of the community as a whole will be affected. More than ever in the field of sewage disposal there is a decided determination to obtain results which are commensurate with costs. There is, on the one hand, sometimes an inclination on the part of the public health official to enforce sewage treatment to the limit, particularly in some parts of the United States and Canada. On the other hand the average municipality wants to do as little as it can get away with. Between these extremes there is the middle path which reasonable people agree is fair, namely, that only as much sewage treatment as is necessary, taking all circumstances into consideration, should be carried out. It would be obviously unreasonable and unjust that authorities should refuse to sanction a system of screening and sedimentation for a city emptying its sewage into a large river which has no municipality downstream drawing a water supply

Dr. G. G. Nasmith, C.M.G.

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1—Hawarth, Experiments of Sewage Disposal at Sheffield, Contract Record, August 17, 1921.

2—Bolton, Aeration Experiments at Bury, Can. Eng. Aug. 29, 1922.

3—Pearse, Sewage Treatment Plant for Calumet Region, Chicago Sanitary District, Eng. News-Record, June 9, 1921.

4—Watson, Dewatering Sludge, Can. Eng. Sept. 12, 1922 from it. It would be more unreasonable to allow such a system to be discharged into a river from which a nearby municipality downstream took its drinking water supply.

A Question of Cost

Sewage disposal in the last analysis is a question of cost. An effluent, brilliant, sparkling and safe, may be produced if the price be paid. The activated sludge system will yield a more perfect effluent than sprinkling filters. But the excess activated sludge has to be disposed of and this again is a question of cost. Is it cheaper to dry the sludge and sell it as fertilizer or dissipate it by digestion processes That is the question which many are trying to solve, and probably the process which is cheaper will prevail. From first hand knowledge with the activated sludge process and experimenting with the sludge as a fertilizer the writer (5) is disposed to look at this problem from the standpoint of nitrogen conservation. But the possibility of any municipality becoming a successful manufacturer of a commercial commodity like activated sludge appears remote. Two distinct lines of attack on this phase of the activated sludge problem,—digestion of the sludge on the one hand and various methods of re-watering on the other, with the object of preparing the sludge for fertilizer purposes,—are going on side by side.

In order to more clearly appreciate developments in sewage disposal a general review of the art is necessary and mention will be made of such developments, improvements, or modifications of processes which seem to be important in the places where they properly belong. Sewage disposal naturally falls into three general divisions, any one of which, or combinations of which, may be desirable under certain conditions. These are,—1, Preliminary Treatment; 2, Treatment of Screened Sewage According to the Type of Effluent; and 3, Disposal of Sludge.

PRELIMINARY TREATMENT OF SEWAGE

During the period of preliminary treatment it is now recognized to be sound practice to remove as much as possible of the smaller suspended solids by means of fine screens, preferably of a self-cleansing type. There are two reasons for this: first, because certain medium coarse floating materials will pass through sedimentation tanks without settling and if sedimentation is the only treatment the effluent may be objectionable in appearance and create a nuisance on bathing beaches. On the other hand, if the activated sludge process is employed it is known the suspended materials eliminated from sewage by fine screens are probably the most difficult of all to oxidize. Longer time of treatment of course necessitates larger tank capacity and more air, and therefore seriously adds to the cost of installation of treatment works. Since types of automatic self-cleansing fine screens are now in operation, and proving efficient, it is desirable before deciding on the type to investigate those now actually in use.

At the Des Plaines River works, Chicago, Pearse finds (6) that each of his Riensch-Wurl screens, 14 feet in diameter, removes 200 pounds per day of wet screenings, though on one occasion after a storm each removed 2,000 pounds. Applications of kerosene are occasionally necessary to remove grease which accumulates on the screens. The recent Dorrco self-cleaning screens are also said to be extremely efficient.

GRIT CHAMBERS

In England retention chambers of much larger capacity than the American grit chambers are used and these take out both grit and a great deal of organic solids which are removed and disposed of at frequent intervals. Consequently as Fuller (7) points out there is not such a great diffeerence as might be expected in the stronger English sewage as prepared for treatment and American sewage passed through grit chambers and Imhoff tank systems because of the accumulations of shoals of sand and grit passing through imperfectly constructed grit chambers and interfering with the subsequent operation of the tanks. The necessity of designing grit chambers of proper size and form should by this time be obvious.

TREATMENT OF SEWAGE

The treatment of sewage may be divided conveniently into partial methods of treatment and complete methods. Under partial treatment one would include every system which does not yield a clear and completely oxidized effluent. The two general schemes which would naturally fall under Partial Treatment are 'Plain Sedimentation' and 'Imhoff Tank Treatment.' These two schemes have for their object the elimination of enough of the suspended solids from the sewage to remove objectionable appearances and to prevent a nuisance being created in the water course into which the effluent flows. Sedimentation, either in plain or Imhoff Tanks, will remove only about 50% to 60% of the suspended solids. In plain sedimentation tanks the tendency is to adopt machinery for the continuous removal of the constantly settling sludge. A recent device employed for this purpose is the revolving Dorrco clarifier which constantly sweeps the fresh sludge towards a central sump from which it is continuously drawn off for subsequent disposal. Sedimentation tanks so equipped never become foul or septic from the decomposition of accumulated sludge and consequently no nuisance can arise from this source.

IMHOFF TANKS

On the North American continent there have been numerous installations of double-storey or Imhoff Tanks; in England very few. This system was attractive because without nuisance it yielded a sludge which was no longer putrescible and was easily dried. Where dilution can take care of the effluent it is a simple and valuable process. The sludge settling out in the upper tank falls into the lower tank where it digests for months, a large proportion of the sludge in the digestion chamber being liquified and the remainder reduced to a small bulk.

Generally speaking, Imhoff Tanks have proved successful. There is a tendency, particularly during the first few months after going into operation, for the tanks to foam, due according to Rudolfs to excessive alkalinity which can usually be controlled. Where Imhoff Tanks have failed it is usually due to defective operation or the destructive action of large quantities of industrial wastes. At Cleveland where a great deal of iron trade waste is received the Imhoff tanks have filled far more rapidly than was anticipat-

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5—[illegible] & Mackay, Fertilizer Value of Activated Sludge.

6—Pearse, Sewage Treatment Progress in Chicago Sanitary District, Jl. Indust. Eng. Chemistry. May, 1918. Eng. News-Record.

7—Fuller, The Present Status of Sewage Disposal in England, Eng. News-Record, Feb. 1, 8 and 15, 1923.

ed owing to the accumulation of high quantities of iron floc. At Rochester is found probably the best operated Imhoff tank system in America. Little difficulty seems to be encountered in the operation of the system and the satisfactory results are claimed to be due to unusually deep digestion tanks.

At Birmingham, Watson produces the results obtained in Imhoff tanks in a somewhat shorter period by digesting four volumes of fresh sludge with one volume of well ripened sludge in separate tanks. Watson finds that sudden rushes of inhibitory chemicals can be better controlled by this system and believes that the process would be far more elastic than an Imhoff system. At the same time it is doubtless cheaper in construction. At Baltimore (8) there will be no further extension of Imhoff tanks but sludge digestion will be resorted to.

COMPLETE TREATMENT

A system of complete treatment of sewage involves, in addition to screening, sedimentation in plain or Imhoff tanks plus trickling filters, or the activated sludge process. The Miles Acid Process (9) and the Direct Oxidation (10) Process, both of which are claimed to be complete in themselves have not as yet been generally accepted.

TRICKLING FILTERS

The inclination in England is to use coarser filling materials in place of the fine which tended to plug up and pond the filters. Barnsly (11) has found that pounding may be prevented by innoculating the filter with an insect known as Achorutes Viäticus and this has been used to practical advantage at Glasgow and elsewhere. The nuisance from small flies breeding in trickling filters may now be controlled by periodically drowning the beds. This necessitates retention walls around the filter and possibly an increase in the acreage of beds to provide for the area thrown out of commission. It is said that a single dose of chloride of lime will achieve the same purpose as drowning.

On the North Side, Chicago trickling filters were dismissed as a possibility because they would require the purchase of fifteen hundred acres of extra land to isolate the areas by half a mile and also seventy acres of sprinkling filters, ten of which might be periodically flooded.

Rudolfs (11a) and Buswell & Long's (12) studies on the fauna and flora of trickling filters and activated sludge are of considerable interest in showing what is going on in the living jelly-like matrix. Rudolfs shows that in the late winter months there is an accumulation of the gelatinous matter in the filter held together by filaments of fungi and that when this sloughs off the beds operate much more effectively. Possibly a dose of copper sulphate applied at the right time would prevent the accumulation of this objectionable material. I have observed that dilution of the sewage by rain seems to induce sloughing of filters.

THE ACTIVATED SLUDGE PROCESS

This system is steadily coming to the fore. Its advantages are that it can be carried on where there is little fall without additional pumping, that it removes all solids from the sewage, that it removes a very large proportion of the bacteria and that all this takes place in one operation in a simple form of tank. The objections to it are that there is a large volume of putrescible sludge produced which must be disposed of; that the cost of operation is high, and that it requires additional machinery and, particularly where the sludge is to be converted into fertilizer, expert supervision. The process is so promising and attractive that most of the recent investigations carried on in sewage disposal have been on this process with the object of reducing the cost of air necessary for ozidation and agitation; to discover what materials interfere with oxidation, or require, large expenditure of air for treatment; to determine the ideal chemical reaction necessary to reduce the cost of treatment and to devise other means of agitation than by the air itself.

It has been found that mechanical agitation can accomplish the same results as agitation with air. Hawarth claims that in his case mechanical agitation costs less than agitation with air. Others do not believe that this will prove to be generally true. In mechanical agitation it is known that the surface film of sewage must be constantly broken in the air to obtain sufficient oxygen to maintain satisfactory oxidation. The system of installing aeration plates on one side of the tank, as at Manchester, to create a rolling motion of the sewage passing through the tanks has proved more economical and effective than the original scheme.

An Elastic System

The activated sludge system is elastic and adapted to varying local conditions. Certain trade wastes, particularly those containing caustic alkali, are injurious to activated sludge. Harris finds that it is easy to clarify sewage and build up and operate with a modified type of sludge which is limited in biological activity. In such cases nitrate is not produced.

Contrary to the opinions of Eddy (14) and others that floculation in sewage cannot be carried out under sterile conditions, Lucas (15) finds that this may be done if iron is added to the sterilized sewage. It is known that the presence of iron in activated sludge is necessary for efficient activation. The experiments of Lucas resulted in the complete clarification of sterilized sewage in a few hours, whereas the sterile sewage without the iron could not be clarified. Whether this proves that bacterial life for the production of activated sludge is unnecessary and that purely chemical and physical agencies are the factors involved in the activated sludge process must at present be left in abeyance. If such be true the role of trade wastes in destroying the activity of activated sludge would be chemical rather than bacteriological.

A rather shrewd suggestion is made by Martin (16) of London, England, in advocating that sewage in long outfall sewers be made to travel in a spiral direction by rotating the same in special chembers on the outfall by means of centrifugal and air jets, the activated sludge used in the process would have

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8—Keefer, Enlargement of the Sewage Works of Baltimore. Eng. News-Record. Oct. 20, 1921.

9—Mohlman, Miles Acid Process of Sewage Treatment. Can Eng. Oct. 24, 1922.

10—The Direct Oxidation Method of Sewage Treatment. Eng. News-Record. Oct. 19. 1922.

11—Harris, Some aspects of the sewage purification problem. Can. Eng. Oct. 31, 1922.

11a—Rudolfs, Imhoff tank and sprinkling filter studies. Eng. News-Record, May 3, 1923.

12—Buswell & Long, Microbiology and Theory of Activated Sludge. Eng. News-Record, Jan. 15, 1923.

14—Eddy, Sludge process developments, Can. Eng. Sept. 1 1921.

15—Lucas, Annual Report Provincial Bd. Health, Ontario 1921.

16—Martin, Sewer Grades and Sewage Disposal. Eng. News-Record, Oct. 20, 1922.

to be pumped back and mixed with the incoming sewage and activation would actually take place in the sewer itself. He believes that a high degree of purification might be achieved though not so complete as in the ordinary activated sludge tank.

SLUDGE DISPOSAL

The disposal of sludge has always been and is the 'bete noir' of the sewage problem. As yet sludge has not been dewatered by any cheap process but there are indications that the solution is only a question of time. Mechanical and chemical means are both being employed and the final solution may be found in a combination of these. Sewage sludge has peculiar properties. We know that in construction of the biolytic (13) tank fresh sewage passing upwards through a mass of sludge tended to clarify itself sometimes to a remarkable degree, just as agitation with sludge in the activated sludge process removes suspended solids and colloid material.

Gore, Nasmith & McKay found that by passing raw sewage through digesting sludge a large proportion of the solids was removed from the sewage and that by automatically returning the excess of activated sludge to this digestion tank it was possible to trap and digest all of the activated sludge solids without the creation of a nuisance. This process, involving a combination of biolytic and activated sludge tanks, was operated successfully from 1917 to 1920 with a high degree of efficiency, producing in the one process thoroughly digested sludge and a completely oxidized effluent. There appeared to be little accumulation of sludge during the period of operation. The process was patented in Canada in 1920 until such time as it could be tried out on a half-million- gallon plant as had been arranged, but unfortunately this opportunity, for ecomomic reasons, fell through and the process has as yet not been worked out on a large scale.

Elrod (17), in his Sept-aer-sed process at Graham, passed the sewage through a septic tank and treats the effluent by the activated sludge process. He finds that there is no accumulation of activated sludge and believes that much less air is required because there is less work to be done. This process tends to confirm the work of Gore, Nasmith and MaKay.

In the MacLachlan (18) process the sludge is treated with sulphurous acid and it is claimed that its colloidal nature is so altered as to allow the solids to precipitate readily and drain easily. This process has been experimented with at Houston and elsewhere with some promise of success. It is claimed that putrefaction is arrested, that a porous granular sludge is produced and that nitrogen value is increased. Excess of sulphurous acid within limits is said to be harmless. By the addition of sulphuric acid to give sludge its optimum active activity (hydrogen ion concentrate) Wilson, Copeland and Henry (19) found that the rate of filter pressing sludge could be increased by 400% while if aluminium sulphate in proper amount, followed by sulphuric acid is used to bring the sludge to the correct acidity, the rate of filtration could be increased 900%.

Many attempts have been made to solve the sludge problem cheaply by lagooning as in Houston and there, with activated sludge, no nuisance seems to have arisen. In places like Toronto where a combination of lagooning and sludge digestion is carried on, care must be taken to cover surface of these lagoons with straw, sawdust or other floating material to produce a thick floating crust as soon as possible in order to keep down objectionable odors.

Lime Treatment Obsolete

The older method of treating sewage with lime to increase precipitation of suspended solids has gone out of use, but a new method in which an excess of caustic lime is employed in connection with electric treatment has come into the field known as the Direct Oxidation Process. The claims made that a non-decomposable sludge and a stable effluent produced is materially due to the electrolytic treatment has been rejected by Lamphear (20) and others and the whole question as to how much the electric treatment has to do with the results obtained by the process is as yet unsettled. The cost of operation, too, would be in many cases very high.

In addition to the mechanical process of removing water from sludge by filter presses either with or without treatment by chemical, a great deal of work has been done in attempting to eliminate water by centrifugal and by vacuum processes. The centrifugal has as yet not proved satisfactory and Hatton (21) finds that even the best type does not retain the finer solids. The Oliver vacuum filter under test by Hatton (22) at Milwaukee, seems to show a vacuum of 22 in. during its passage through the sludge (with a pH valve of 3.3 to 4) picks up a film of solids on the fabric. This film is then subjected in the air to a vacuum of 11 inches whereby the moisture is reduced to 80%. There is, in this process, a constant building up of sewage film removal of water from it and removal of the dehydrated sludge from the revolving filter.

At Syracuse (23) an unique method of sludge disposal has been adopted by pumping the sludge 12 miles to the Solvay works and there mixing with the lime wastes which precipitate the solids.

In the Miles Acid Process sewage is treated with sulphurous acid and the settled sludge disposed of by filters, presses or other means. Its bulk according to Mohlman (8) is approximately that of Imhoff sludge and the effluent is clearer than an Imhoff effluent. The amount of acid required and therefore the cost is determined by the amount of alkalinity in the sewage. One disadvantage is that it dissolves iron which may be re-precipitated in streams causing an objectionable appearance, Excess of sulphurous acid quickly removes oxygen from water into which it is discharged. This method of treatment may prove decidedly useful as the only alternative in certain cases where trade wastes seriously interfere with the ordinary method of treatment.

DILUTION AS A METHOD OF DISPOSAL

This old established and standard method is now clearly recognized to have its definite place as an approved method in the realm of sewage disposal. There is a growing acceptance of the principle that disposal by dilution is economically sound under cer-

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13—Coulter, Removal of Colloids From Sewage. Eng. News-Record, Oct. 6, 1921.

17—Elrod. New System of Sewage Treatment at Graham, Texas. Eng. News-Record, April 5, 1923.

18—Eagles, Disposing of Activated Sludge, Can. Eng. Oct. 17, 1922.

19—Wilson Copeland & Henry. Application of Colloid Chemistry to Sludge Pressing. Eng. News-Record, June 16, 1921.

20—Lamphear, Lime treatment of Sewage Compared with Direct Oxidation. Eng. News-Record, August 24, 1922.

21—Hatton, Use of Centrifuge for Sewage Sludge Dewatering. Eng. News-Record, February 13, 1922.

22—Hatton, Activated Sludge Plant to use Vacuum Filters. Eng. News-Record, Feb. 1, 1923.

23—Holmes, Unique Sewage Works. Eng. News-Record, Dec. 28, 1922.

tain restrictions, viz.: that nearby water supplies be not contaminated beyond a certain degree, that bathing beaches are not seriously affected and that visible or other nuisance be not created. The International Joint Commission found that the use of streams for drainage and sewage constitutes a natural resource and as such should be conserved, considering the rights of the people as a whole. It also was of the opinion, and sanitarians in general agree with their finding, that all surface water supplies, even when not polluted with sewage, should be purified. The logical step is to make every municipality treat its sewage to such a degree that no undue load be placed on water treatment plants. C. J. Mackenzie (24) states that over 50% of the sewage in Canada is discharged directly into streams, lakes and tidal waters without any treatment whatever, while a large proportion of the sewage nominally treated is discharged into lake waters after limited preliminary treatment as at Toronto.

In reality all sewage disposal methods resolve themselves into the preparation of sewage for final treatment by dilution, and viewed from this standpoint the principles indicating the trend of practice in the art of sewage treatment may be stated as first,—that surface supplies are the natural drainage channels as well as the sources of public water supplies; second,—that no water should be taken from surface sources without treatment of some sort or sewage discharged into them without at least receiving a minimum treatment by fine screening and, third,—that partial treatment of sewage and complete purification of water supplied are more effective and controllable than complete sewage purification.

Each Case on Its Merits

It is unwise and unsound to demand that every city or town should purify all sewage discharged into the water courses to the same degree. Each sewage disposal problem must be considered as a special case and the final decision of any municipality as to what system is to be adopted will be governed by the two factors of cost and sanitary results desired. For this reason the English practice of a Rivers' Conservancy Board approved of by Fuller is beginning to be adopted in the United States under the name of Sewage Treatment Zones (25). The States of New Jersey and Pennsylvania are collaborating in this way and willl demand different treatment in different zones of the river. In the upper zone a clarified and oxidized effluent will be required. In the middle zone the removal of settleable solids and such further treatment as may be necessary to safeguard water supplies; while in the lower, or tidal zone sedimentation and deep submerged outlets with possibly further treatment to safeguard water supply will be employed. It is to be hoped that such a system will be extended.

At Syracuse the sewage, after passing through half-inch screens, and plain sedimentation tanks, will be discharged into Onandaga Lake through deep multiple outlets 1,600 feet from shore. At Indianapolis (26), when the watercourse into which the sewage is discharged is running low during the summer months, complete activated sludge treatment will be required. During the balance of the year or period of greater dilution it will be necessary to remove only the coarse and fine solids by screens leaving an effluent within the digestive power of the river. Here there is no water supply for 175 miles below the city and full advantage has been taken of the river's power to oxidize. At Cleveland (27) the sewage after passing through the westerly or smaller works consisting of coarse screens, grit tanks and Imhoff tanks is discharged into Lake Erie and the sludge dumped several miles out, while grit tanks from the easterly or larger works consisting of coarse screen and grit tanks is discharged through submerged multiple outlets. The contaminated area is clearly discernible from shore by color, oil and other objectionable material. In summer time it is proposed to chlorinate the effluents in order to safeguard the bathing beaches.

Now that the purification of municipal water supplies is general and where most surface water supplies are both filtered and sterilized, there is not the same reason for insisting on the complete treatment of the sewage in all cases (28). Nevertheless, public opinion, created through health education, is stronger than ever that the drinking of diluted sewage is both unnecessary and offensive to the sentiment.

Each System Has its Place

It may readily be seen that it is a difficult matter to summarize trends in sewage disposal. There is a field for every process of sewage disposal as the report of the Committee on Sewage at the Convention of the American Society for Municipal Improve- clearly sets forth and it is unwise to be carried away with any single process to the exclusion of all others. Each has its place depending on circumstances. Where rivers are concerned sewage disposal is usually for the benefit of other municipalities and is therefore not likely to be too popular a process upon which to spend money. Where lakes are concerned, since the lack of sewage treatment frequently means contamination of the municipality's own drinking water supply, sewage disposal is more apt to be a live issue locally.

The limitations of each process of sewage disposal are being more clearly realized both as cleansers of water supplies and protectors of public health. The cleansing features of sewage disposal systems have made decided advances in recent years. As bacteria removers the new process of activated sludge exceeds in efficiency the trickling system, though hundreds of the latter type of systems are operating satisfactorily all over the world. And naturally when a system combines in one tank bacterial and cleansing properties it is looked upon with favor provided it can be built and operated at a cost which will favorably compare with older systems. Therefore the activated sludge system is receiving much consideration at the hands of scientists and engineers particularly with the purpose of reducing operating costs. If economical operation depends altogether upon the sale of resulting fertilizers its general acceptance in large municipalities would appear to be doubtful until such time as costs come down. Meanwhile it has a very useful field for smaller works and institutes where the sludge is small in quantity and easily disposed of.

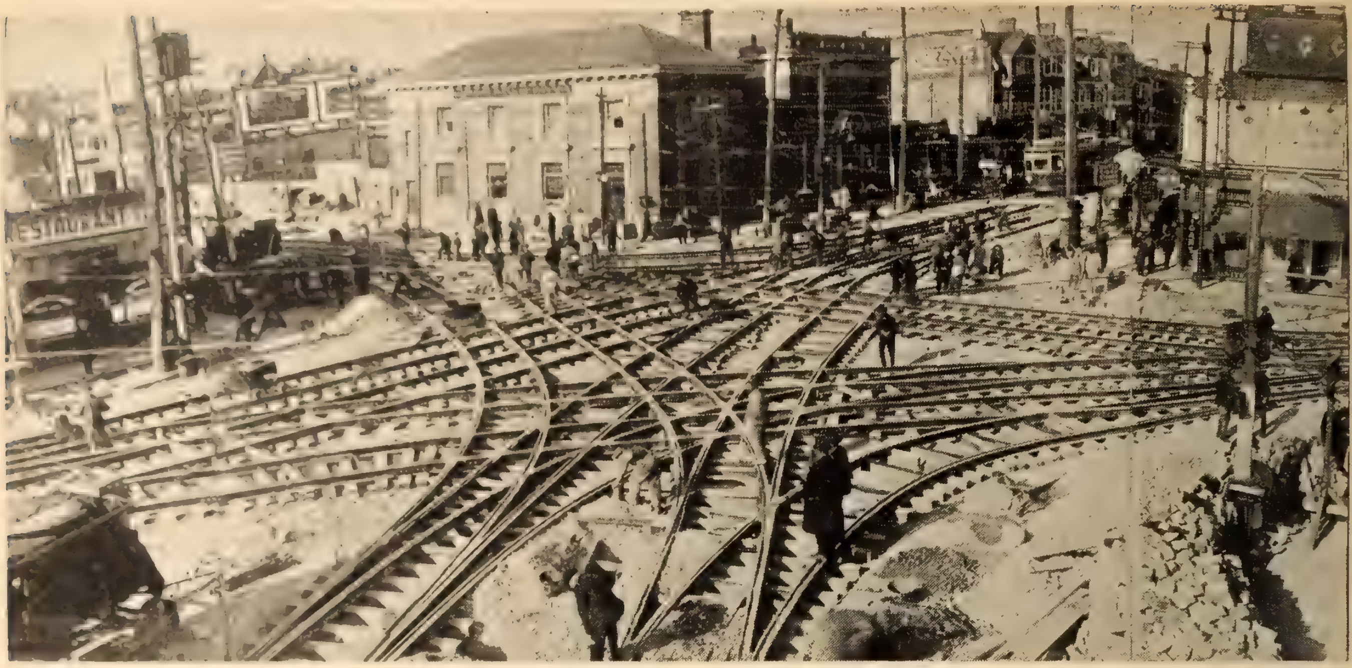
24—Mackenzie, Developments in Sewage Disposal. Jl Engineering Institute Canada, May, 1922.

25—Delaware Sewage Treatment Zones. Eng. News-Record, August 10, 1922.

26—Hurd, Clarification and Activation for Indianapolis Sewage. Eng. News-Record, March 23, 1922.

27—Gascoigne, Cleveland's Westerly and Easterly Sewage Works in Use. Eng. News-Record, Sept. 28, 1922.

28—Jackson, Pollution of Streams Affecting Industrial Uses. Jl. New Eng. Water Works Assn. Vol. XXXVI, No. 1.



An intersection weighing 133 tons, equal to 2252 feet of track installed during night in 9 hours 5 minutes

Toronto Transportation Commission Have Just Completed in Record Time

The Largest Inter-section in America

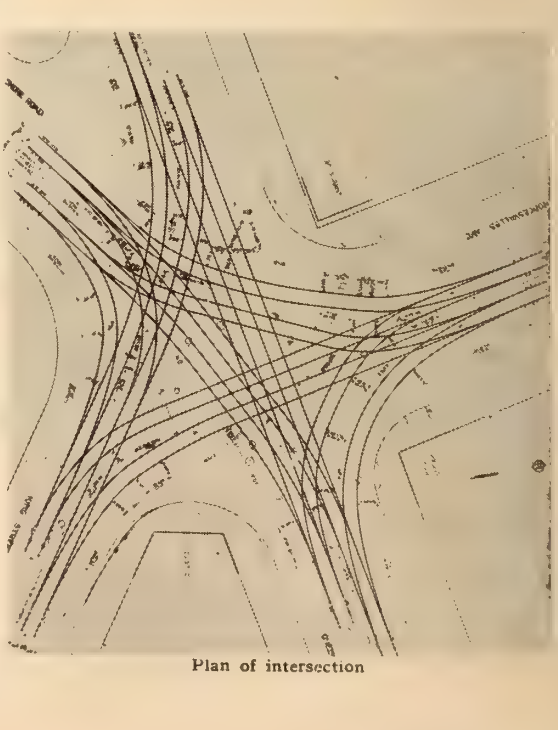
Its Weight is 133 Tons; Length, Single Track, 2252 ft; Number Joints, 429; Crushed Stone Foundation, 458 Tons; Time to Erect, Nine Hours Five Minutes

The Transportation Commission of Toronto has, in record time, just completed the laying of an intersection that is the largest in Canada, and perhaps the largest in the continent, in the construction of which over one hundred and thirty-three net tons of steel have been employed. The layout includes eighteen switches. The location is Queen St. and Roncesvalles Ave.

The changing of existing special track work at this point was necessitated by the need for re-routing cars on five busy main thoroughfares which converge here, and also to facilitate the operation of an extensive car house in the block to the north east of the intersection of these streets. The fact that five double tracked streets come together lends some interesting features to the track layout, which is not, however,a complete junction in the nature of a grand union, as double track curves do not connect in all directions. Nevertheless the layout contains two more switches than a grand union has, and there is also, in the neighborhood of thirty-five per cent more track mileage involved.

Double track curves have not been installed in the North West quadrant, but this has been provided for in the design, so that very little of the present layout will need to be scrapped if the installation of these two additional curves is necessitated at some future date.

The work is fabricated from one hundred and forty pound A.E.R.E.A. and one hundred and twenty-two pound grooved girder (tapered head) steel rail section, and is of type "A" construction, that is, solid



Plan of intersection

manganese steel switches, mates and crosses with No. 1 rail.

The extent of the work in terms of single track is twenty-two hundred and fifty-three feet. Some idea of the detail involved in the manufacture of the layout can be gathered from the facts that there are four hundred and twenty-nine individual joints, one hundred and twenty-nine cast pieces, one hundred and forty separate pieces of rail and one hundred and ninety-three tie rods.

While the steel work is necessarily the outstanding feature of the special track work layout, there are other important details which add to the volume of the work. In this layout three hundred and eight standard eight foot ties and twenty-two thousand one hundred and seventy board feet of special ties, ranging in length from nine to twenty feet, were laid under the steel, totalling thirty-two thousand and twenty-six board feet of timber. Seven hundred and seventy-seven tons of crusher ballast were used. The paving of the roadway conforms to the established standard of the Commission. This standard requires the filling of the inter-tie space from the bottom of ties to the top of the base of rail with concrete; this concrete is a 1-3½-8 mix. Upon the paving base granite setts are laid on a sand and cement cushion to the level of the top of the rail, and the spaces between the granite setts are then thoroughly filled with cement grout. This special track work required two hundred and one cubic yards of concrete in the paving base; over an area of fourteen hundred and thirty square yards, forty-five thousand granite blocks were set.

Summary New Steel

140 A.E.R.E.A.
122 grooved girder (Tapered Head)
Construction —Type A, viz. solid manganese steel switches, mates and crosses, with Class No. 1 rail.
Length of steel in single track—2,252 feet.
Weight of steel—266,185 lbs.=Net Tons 133.
Number of Joints—429
Number of cast pieces—129.
Number of pieces of rail—140.
Number of tie rods—102 flat, 91 round.

Ties

Number standard ties—300
Bd. feet special ties—22,170
Total board feet of ties— 32,026
Ties are of yellow pine or white oak or similar high class of timber.

Foundation

Crushed stone foundation—458 tons.

Paving

Concrete Paving Base—201 cu. yds.
Paving area of S.T.W.—1,430 sq. yds.
Number paving setts used—45,000.

Two-Million Dollar Repair Shops

Excavation Work About Completed and Foundations Going in—Site Well Chosen in Centre of System With Area Over Twenty-two Acres

When the Toronto Transportation Commission took over the system of the Toronto Street Railway it was obvious that new repair shops would require to be built. The buildings which housed the repair work of the system were so dilapidated and the layout was so antiquated and inadequate in size that they were obviously unsuitable for the enlarged requirements of a system operated with a larger and newer type of rolling stock. A survey was made of the requirements of the system and inspection was made of many of the leading car repair shops in the United States and Canada and the best authorities consulted before the final layout was decided upon.

Property was purchased at the corner of Bathurst Street and Davenport Road, a site which is very close to the centre of gravity of the whole system and which contains 22.24 acres. A portion of this site will be devoted to a yard for the Way Department and the remainder will be taken up by the general repair shops, stores building and subsidiary buildings. The property is located immediately north of the C. P.R. main line and will be served with steam road sidings.

The general layout embraces a main building accommodating all shops concerned with the repair of the cars; a general stores building; an office building; a boiler house; a coal and ash handling plant and various subsidiary buildings such as oil stores, charcoal and sand storage, intersection shop, garage, scrap bins, etc.

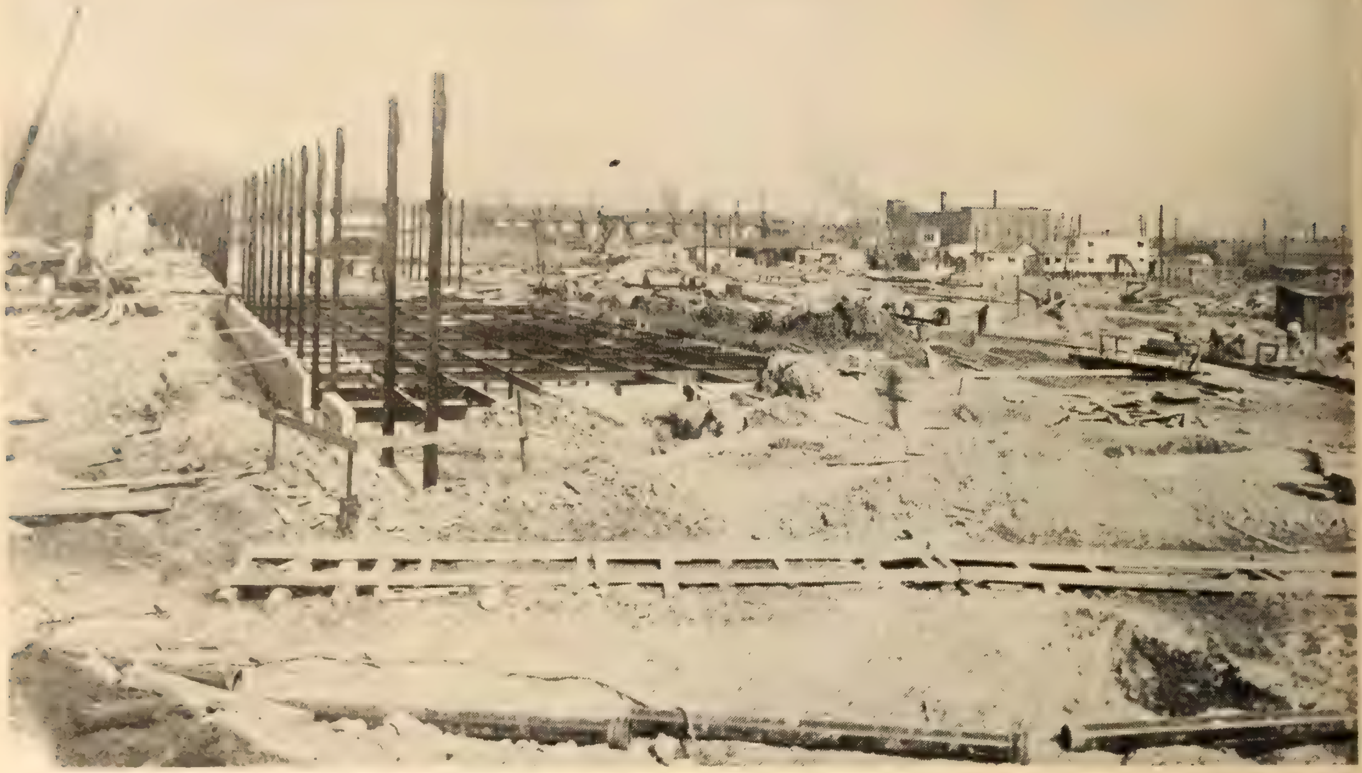
Main Building

The main building comprises a covered transfer way, machine shop, wood working shop, paint shop, motor and truck shop as well as free stores area, lunch room, locker room and lavatories, etc. There are basements under the wood working shop, a portion of the truck and motor shop, the free stores area and the forge shop. The general dimensions of the building are 467′ 0″ x 452′ 0″.

The building will be all under one roof. The construction will be steel frame with brick walls, and the roof will be of precast Gypsum block with saw-tooth monitors giving a north light. The floors will be concrete, wood blocks and mastic where appropriate and inspection pits of concrete framed on steel columns and beams. The heating will be an indirect hot air system except in the paint shop where a direct radiation system is provided. A complete system of automatic sprinklers will be provided throughout the building and a system of fire hydrants throughout the adjacent yard. As an auxiliary supply for fire purposes a 100,000 gallon tank will be provided at the north-west corner of the property.

Boiler House

The boiler house will be of similar construction



General Repair Shops of T.T.C., Bathurst St., Toronto, looking east—May 4, 1923

to the main building and be connected to the main building by a pipe tunnel which also extends to the general stores building and office building.

Coal and Ash Handling Plant

Just north of the boiler house there will be a complete coal and ash handling plant comprising two concrete storage bins each of 500 ton capacity fed from a track hopper with an apron feeder and elevator conveyor. A flight conveyor will connect the bins with the boiler house coal bunkers.

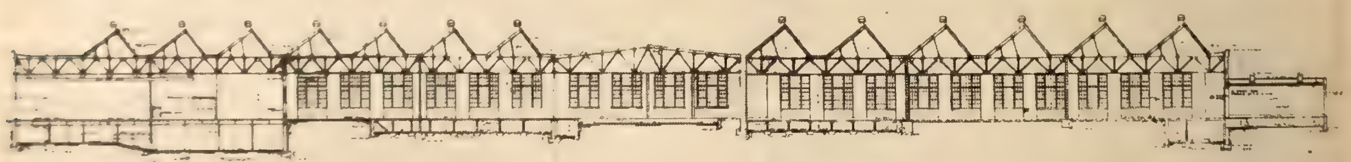
General Stores Building

A general stores building will be located at the south-west corner of the site fronting Bathurst street and will be shared by the Toronto Transportation Commission and the Toronto Hydro-electric System.

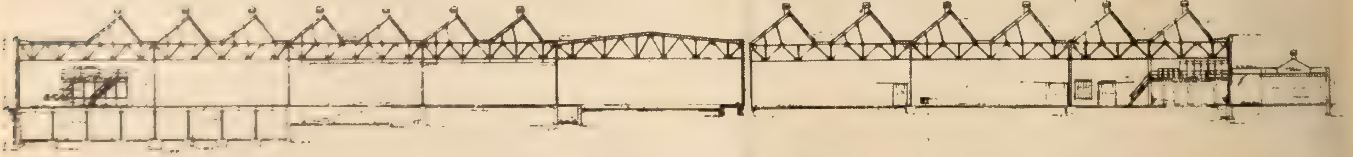
The building will be of reinforced concrete flat slab construction 306 ft. long by 117 ft. wide, with a two storey extension at the west side to accommodate a shipping bay. The exposed street front on Bathurst street and the north and south elevations will have a Queenston base and an artificial stone facing up to the top of the first storey windows. Panels between the windows and the upper floor in these elevations will be of artificial stone of an ornamental character. The remainder of the facing will be of brick.

Provision has been made in the basement and ground floor for the direct entry of motor trucks and a railway siding is also provided on the shipping siding of the ground floor.

The building will be equipped throughout with automatic sprinklers. The heating will be direct radiation, steam pipes being brought from the main boiler house in the concrete tunnel. The building will be, for the present, three storeys and basement but provision has been made for the addition of four



WEST SECTION (J.J.)



EAST SECTION (K.K.)

Elevations of East and West Sections T.T.C. car shops, Toronto more storeys, as the future expansion of the system may demand. The building will give an immediate storage area of 132,600 square feet, and a future floor area of *227,700* square feet.

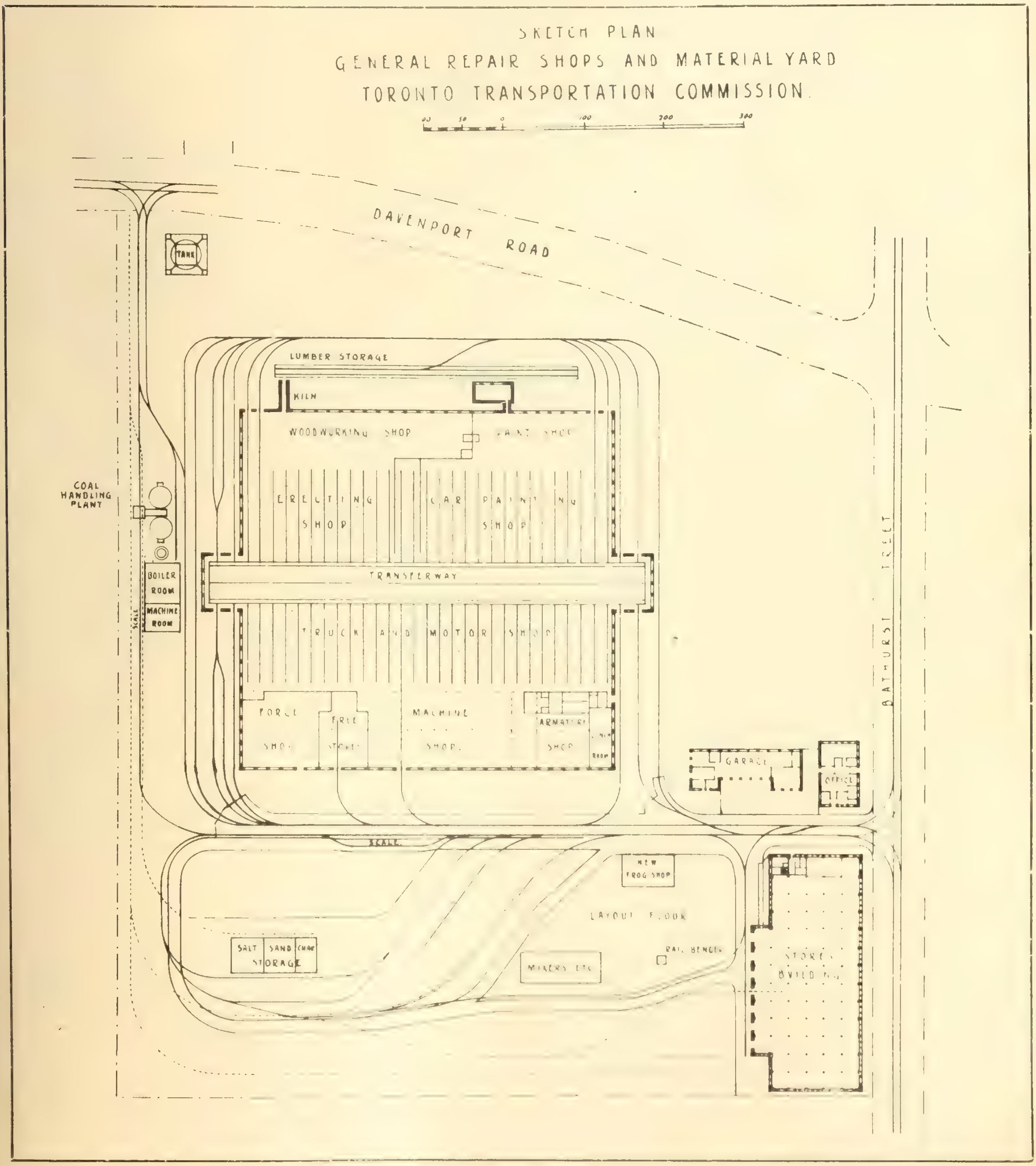
Office Building

Just north of the general stores building and fronting on Bathurst St., an office building will be erected accommodating the superintendent of rolling stock and his staff, first-aid room and an employment office.

This building will be 51'0" x 82'0" two storeys in height with a steel frame, brick walls and slate roof. The Bathurst street elevation will have stone base and artificial stone trim in keeping with the general stores building.

Plans are now being prepared for the garage, intersection shop and other subsidiary buildings, and it is expected that tenders will be called for on these and for the office building in the course of the next month or two.

The contract for the main building, boiler house and general stores building was awarded to the John V. Gray Construction Co. Ltd. on January 25, 1923 and work was commenced in February. The occupation of the building is scheduled for October 31st, 1923.



The contract for the coal and ash handling plant was awarded to McNiven Bros. Co. Ltd., and work on this project has just commenced.

At the present time footings and foundation walls have been completed for the north half of the main building, and structural steel is in process of erection on this portion.

The contractor is now installing footings and foundation walls for the south half of the building and also for the general stores building.

The following sub-contracts have been placed by the John V. Gray Construction Co. Ltd.

General excavation, Rillette Bros.; excavation for drains, McKnight Construction Co.; cut stone, Geo. Oakley & Sons.; artificial stone, Benedict Stone, Montreal and Peerless Art Stone Co., Toronto; structural steel, Dominion Bridge Co.; miscellaneous iron, Dennis Wire & Iron Co.; rolled steel sash, Canadian Metal Window Co.; roofing and sheet metal, A. W. Carmichael, Ltd.; rolling steel doors, A. B. Ormsby; painting and glazing, Bavington Bros.; elevators, Otis-Fensom Elevator Co., Ltd.; automatic sprinklers, plumbing and heating, W. J. McGuire, Limited; electrical wiring, J. E. Myers.

The cost of the buildings alone will be approximately one and one third million dollars. Including land and equipment, the total will approximate two millions.

Roncesvalles Car Sheds Contract Awarded

In connection with the Toronto Transportation Commission's re-routing programme it has become necessary to house some 120 of the latest type of cars in the Roncesvalles car house.

The present car house is a relic of the horse car days, and owing to lack of clearance between the tracks and at the entrances, it is impossible to house the new cars there at all. The existing yard is also antiquated and will only accommodate about thirty cars. It was found uneconomical to attempt alterations to the existing services, and accordingly it has been decided to proceed with the construction of an entirely new car house and yard.

The existing car house and yard is single ended with all switches on Roncesvalles Avenue. Additional property was purchased and a new yard has been laid out north and south with the main entrance on Queen St. West, and an additional entrance for trailer operation from Roncesvalles Avenue.

The new car house will comprise two units: a main building accommodating two inspection bays and a repair bay, boiler room, stores and mechanics' toilet and locker rooms, and a separate office building accommodating the divisional superintendent's office, ticket wickets, trainmen's rotunda, and recreation room, lavatories, etc.

The main building will be of reinforced concrete construction with brick and tile curtain walls and steel sash. Additional lighting will be provided by sky-lights in the roof. The building will be divided into three bays, each 285 ft by 44 ft. 6 in. Two of these bays will be for the inspection of the cars and the third bay will accommodate the repair section, boiler room, stores, mechanics' toilet and locker room, etc. The inspection bays and repair bay will be provided throughout with concrete pits. The repair bay will be equipped with jib cranes, drills and other machinery for the execution of minor repairs. The main building will be heated by an indirect hot air system, and the air "fan driven" through concrete and tile ducts, the outlet located under the pits. The building will be equipped with automatic sprinklers throughout as well as fire hydrants and will be to all intents and purposes fire proof.

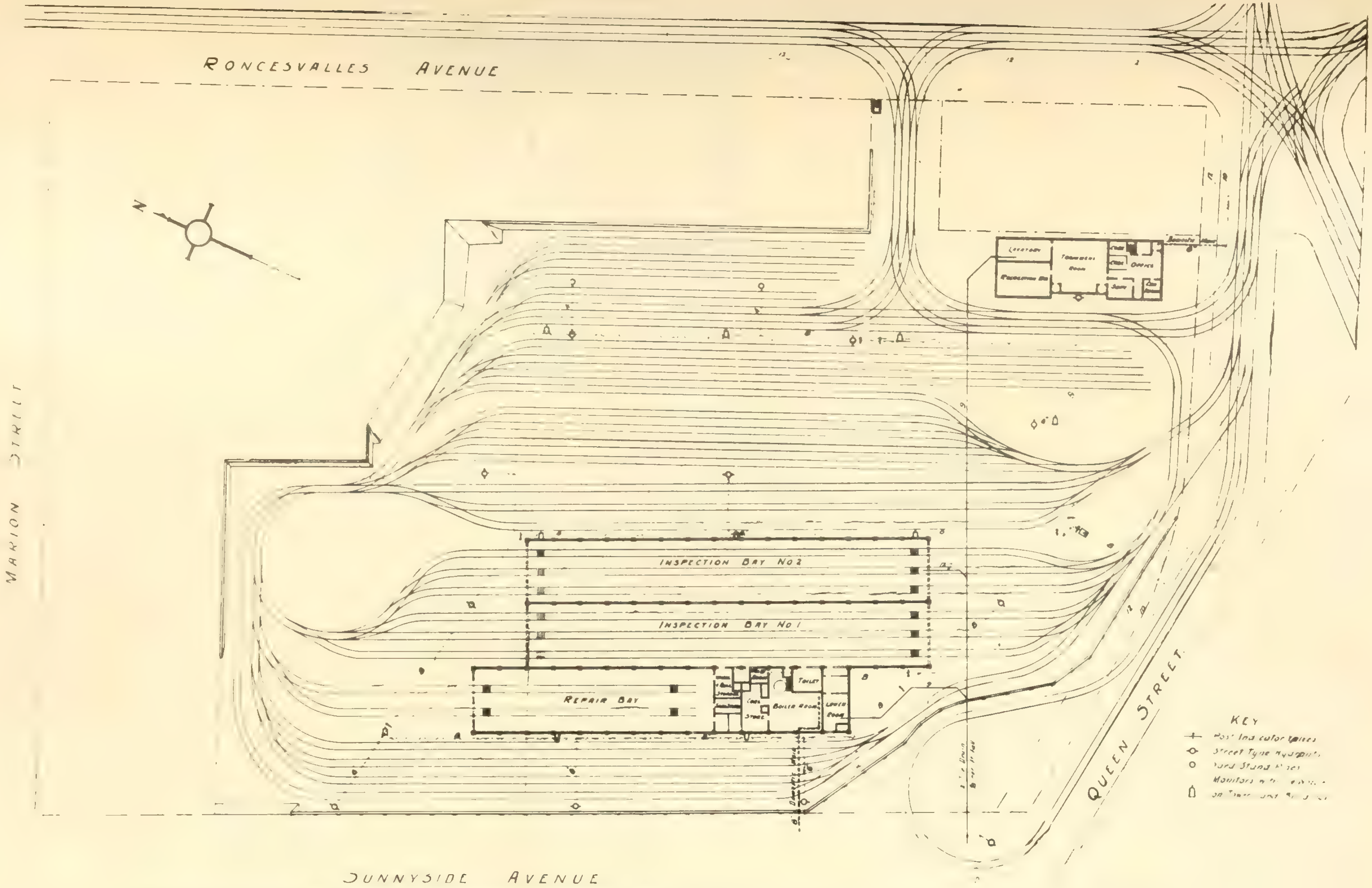
The Office Building will be situated just east of the main entrance on Queen St. West and will be brick with steel frame, 118 ft. by 42 ft. The central portion of this building will be laid out as a rotunda where the trainmen will obtain their tickets, sign in, and make their reports. The south wing will accommodate the offices of the divisional superintendent and his staff of clerks. The north wing will accommodate the trainmen's recreation room and lavatories. The building will be heated by an independent steam radiation system with the boiler room located in the basement.

The yard has been laid out north and south, and the cars will enter from Queen St. West, and will proceed to the north end of the yard and thence around the loop into the car house, and after inspection will continue back to Queen St. again. There will be three through tracks in each inspection bay in the car house and two dead-end tracks in the repair bay. The adjacent yard will consist of a run-round track and through sidings together with seven dead-end sidings. The loop around the office building and the corner of Roncesvalles Avenue and Queen St, will be used for trailer operation. The loop at the corner of Sunnyside Avenue and Queen Street will be a terminal loop for the Queen Street Cars. The total accommodation of the yard will be 180 new cars, 34 of which will be accommodated in the building.

A complete fire protection system will be installed throughout the buildings and yard. Monitor nozzles will be located on the roof of the buildings and monitor towers and hydrants throughout the yard, and a fire alarm system connected to the City fire alarm system will also be installed with stations throughout the yard.

Excavating Equipment Bulletin

The Pawling & Harnischfeger Company, Milwaukee, Wisconsin, manufacturers of cranes and excavators, have recently issued new bulletins featuring P & H excavating equipment. Their 58—X Bulletin features the clamshell, dragline, orange peel, backfiller, crane hook, electro-magnet and pile driving rig, with which the P & H excavators may be equipped. The 16—X Bulletin features P & H trenching machinery. The Testimonial Bulletin is made up of a series of letters written by some of the users of P & H machinery.



Layout of Car Sheds at Roncesvalles Avenue for which contract was let on May 23 to Sullivan & Fried at about $280,000.00

Future Years Will Show Constant Development in Bridge Design Practice

The Introduction of New Materials and Improved Shop and Field Equipment Exert an Important Influence on the Character of Bridge Structures—The Tendencies of the Present Day Indicate the Progressive Nature of the Art

By C. R. YOUNG, B.A.Sc., C.E.
Associate Professor of Structural Engineering, University of Toronto

Although men have been building bridges since the dawn of civilization, the art of bridge construction is still in the progressive stage. While there were considerable periods during the middle ages when development was slow, this was due to the fixity of the materials available. Once iron and steel had been applied to bridge construction, a vast field for development opened out which is still being eagerly and profitably explored. A similar process is going on with respect to the application of concrete and reinforced concrete to bridge construction. It is very probable that we shall see remarkable developments in bridge design and in related construction practice within the next generation.

Factors Influence Design

Bridge design is influenced and shaped by a number of important factors which themselves grow out of the research activity of the engineer. With the development of new or improved materials, striking changes are brought about. As the equipment for construction and erection, whether it be used in shop or field, is improved, the character of the structures designed by the engineer will be modified. Laborious mathematical investigations of the characteristics of bridge structures may cause the abandonment of unsuitable types and the adoption of others more desirable. At the same time, the pushing of a type to a hitherto unattained limit may follow such refinement of analysis. There are, too, from time to time, new types of structural members and details making their appearance and raising the efficiency of employment of structural materials for bridge purposes. The character of the superimposed loads, which constantly changes with the development of wheeled transport, whether on highway or railway, has an important effect on the design of bridges.

Influence of Improved Steels

Structural steel may now be assumed as a thoroughly standardized product. Its properties are well known, as result of many years of experience with it in laboratory, shop, and field, and there is no material which the engineer can employ with a greater feeling of confidence. Growing out of this, there is a disposition at the present time to increase allowable stresses and to utilize to a greater extent the potentialities of the material. Thus, for the new 140-ft. railway arch span to be erected shortly by the Michigan Central Railroad over the Niagara Gorge, the allowable stresses in tension for dead load and live load are respectively 20,000 and 18,000 lb. per sq. in. with similar units for compression. This case is but typical of the trend of practice for large structures built of structural steel. It is interesting in this connection to note that the new specification of the American Institute of Steel Construction devised to apply to steel building work, fixes the allowable stress on structural steel as 18,000 lb. per sq. in. in tension, and 18,000 reduced for compression.

A fascinating field for the bridge designer is opened by the remarkable developments in alloy and other high strength structural steels within the past few years. For many years, it was felt that the use of a steel with a higher carbon content than material of the common structural grade was impracticable in bridge work because of the difficulty of working it in the shop. As a result, the attention of metallurgists in this field was directed to improving the so-called alloy steels. Nickel steel as the first of these materials has had a very considerable employment in bridge work, following its initial use in the eye bars of the Queensboro cantilever bridge over the East River at New York. It was later employed in the stiffening trusses of the Manhattan suspension bridge, in the 668-ft. truss spans of the Municipal bridge, St. Louis, in the Quebec Bridge, in the 591-ft. arch span of the Detroit-Superior bridge at Cleveland, and in many other remarkable structures built in recent years.

Prof. C. R. Young

An important aid to the bridge designer has been furnished by the metallurgist during the last decade through the development of what is known as silicon steel. This material, which is fairly high in both silicon and manganese, has been employed to an important extent in the largest simple truss span in existence, the 720-ft. span of the Metropolis bridge carrying the Chicago, Burlington and Quincy Railroad over the Ohio River. This structure, built in 1917, was designed for a permissible tension in built up members of 25,000 lb. per sq. in. and in silicon steel eye bars of 30,000 lb. per. sq. in. with related units for compression. The 700-ft. simple truss span on the Alaskan Railroad, over the Tanana River, also contains silicon steel, with a permissible manganese content of 1.0% and with a silicon content of 0.45%. The ultimate strength of the material is specified as from 80,000 to 90,000 lb. per sq. in. with an elastic limit not less than 45,000 lb. per sq. in. It is easily seen that with a material of this character available, the possibilities of further development in long span bridge construction are greatly improved.

Rather curiously, the application of hard steel to bridge construction came about through a peculiar market condition arising from the war. Gustav Lindenthal had hoped to employ nickel steel in the great 977½-ft. Hell Gate Arch, but found the price so high at the time that he looked elsewhere for a solution of the problem. As a result, he decided to use a steel with a higher carbon content than usual, having an ultimate tensile strength of from 66,000 to 76,000 lb. per sq. in. This material proved entirely satisfactory. It was used also on the great continuous bridge at Sciotoville, Ill., and in the 644-ft. riveted truss span built by the Pennsylvania Railroad over the Ohio Railroad at Louisville, Kentucky, in 1919.

Use and Development of Concrete

The general adoption of reinforced concrete as a floor material for steel highway bridges has brought about the use of much heavier structures than formerly were employed for highway traffic. Whereas twenty years ago, the lightness of highway bridge floors made the use of pony Warren trusses with T-chords possible, this type of chord is rarely seen nowadays, except for the shortest spans. At the same time, the greater weights have incidentally brought about the use of heavier metal, which in turn has given to highway bridges, a longer life than they possessed under the old practice. The benefits to the structure as a whole through the reduction of impact and vibration has simultaneously contributed to the comfort of the traveller and increased the staunchness of the structure through the reduced liability of joint rivets to loosen.

General employment of concrete in the floors of railway bridges in grade separation structures, has brought about important changes in design in this particular field. Formerly, trough plates exposed on the under side were commonly seen for such crossings, but the modern practice tends towards the use of thoroughly enclosed steel beams giving not only perfect protection to persons passing under the bridge, but also an exceedingly solid, staunch and durable structure for the traffic using it.

The design of concrete bridge structures is also being influenced to an important extent through the use of richer mixtures than were formerly employed and through the occasional use of specially light concretes. In order to reduce the weight of the structure and the amount of material both in superstructure and foundations, concretes with a crushing strength of between 2,500 and 3,000 lb. per sq. in. at 28 days are being adopted by many engineers. An instance of this is in the Governor's bridge, Toronto, for which a contract was recently let. Not much has been done in Canada in the matter of employing light-aggregate concretes, but some important applications of such material have been made in the United States. Thus, for the 1600-ft. Bingaman St. Viaduct at Reading, Pa., built in 1921, a slag concrete was employed with success. Not only was the weight of the bridge itself reduced considerably, but less labor was required to handle the material, and rather remarkable, the contractor reported that slag concrete was more workable and flowed more readily into the forms than ordinary stone concrete.

Effect of Improved Equipment

In steel bridge work the adoption of a given type of structure may depend to a large extent upon the character of equipment available in the shops of the contracting company or for erection of the structure in the field. Very long or very heavy members may be out of the question for the particular shop receiving the contract, as may be the problem of erecting the structure in partly assembled condition. It would manifestly be entirely impracticable to design a structure with members of the size and weight of those of the Quebec bridge and expect it to be fabricated and erected unless shops and field equipment were available to handle such members. It will be remembered that special equipment and special shops were built for the construction of the Quebec bridge. The designer must always take into account the available capacity of bridge plants before deciding upon a particular kind of design. A simple instance of the influence of equipment on design is the tacit limiting of the span of plate girder bridges to about 130 ft. The longest simple plate girder bridge in existence in America, namely the 130.5-ft. span of the Nickel Plate Railroad at Grand Crossing, Ill., was built in 1916, and there is no immediate prospect of exceeding it to any great extent.

The influence of equipment and plant on the design of concrete bridge structures is also important. Thus, for a small bridge of this type constructed by a contractor with only a local field, the simplest possible details should be adopted. Complicated reinforcement cannot be fabricated or bent with any assurance of accuracy by the rough and ready methods followed by many small contractors. Simple rods with the fewest possible number of bends should in such instances be employed. The length of span of a concrete arch may, at the same time, be dictated to a large extent by erection contingencies. If contractors likely to bid on the work do not possess equipment and plant for adequate centering of a long span arch over a river, there is no use in attempting such a structure. Not every contractor would undertake the use of adjustable, shifting steel centers to be floated into position on pontoons. If a bridge of this character is proposed, the capacity, equipment and experience of likely contractors must be taken into account.

More Careful Analysis

It must be admitted, with regret, that many bridge structures have been designed with indifferent care. There has been too much of the slap-dash in the preparation of designs of medium and short span bridges, particularly those for highway traffic. Many persons attempt the design of bridges with a rather meagre acquaintance with the refinements of the art. As in the case of design of buildings, there is too much of the handbook method in the design of bridges. To cover errors and omissions and approximations of analysis a very liberal factor of safety has heretofore been adopted. Because of such a condition the average client has been forced to pay more for his bridges than otherwise might have been the case. The writer does not believe that a factor of safety of two on the elastic limit is a necessity for a carefully designed bridge with full allowance for probable increase in loading. He believes that the procedure of the Michigan Central Railroad engineers in designing the new arch at Niagara is eminently sound. Every possible source of stress was carefully considered and the greatest likely increase in loading was taken into account. This done, allowable working stresses were increased to at least 18,000 lb. per sq. in. in tension, and in the case of dead loads for the arch trusses, to 20,000 lb. per sq. in. The time is coming when the engineer will not dismiss secondary stresses with a gesture of impatience and cover them with an indefinite factor of safety. He will take them frankly into account and get a greater duty out of the material which he employs.

New Types and Details

There has been in recent years a tendency towards simplification and standardization of bridge trusses. Subwebbing is being omitted by some of the most progressive of bridge engineers, and trusses with longer panels than heretofore are being employed. This results in a heavier floor system but reduces secondary stresses and gives a smaller overall pound shop cost for the material. Protest is heard against the subdivided Pratt truss—which is designated either as the Baltimore or the Petit depending upon whether the top chord is horizontal or curved—not only because of the high pound cost of the erected material, but by reason of the fact that there is often a good deal of the material employed in purely nominal members inserted for the sole purpose of staying compression members against lateral buckling. An interesting substitute for the conventional long span Petit truss was employed by C. A. P. Turner in the Bismark-Mandan bridge over the Missouri River, North Dakota, in 1922. This consists of a curved top chord truss with a triangular system of webbing. Avoidance of the difficulties of the Petit truss and reduction in the number of joints are said by Mr. Turner to have affected a very considerable economy.

Many bridge engineers are of the opinion that a more extensive use of the continuous type of bridge will be made in the future than has been made heretofore on this continent. As a type it is popular in Europe, but has never been adopted extensively in America. The most notable example of this type ever built in Canada was the famous Lachine bridge of the C.P.R. replaced in 1913 by a bridge of simple truss spans. The only other continuous span of any consequence in Canada known to the writer is the Kettle Rapids bridge over the Nelson River on the Hudson Bay Railway, constructed in 1918. This contains three continuous spans of 300, 400 and 300 ft., and advantages demonstrated in the construction of this structure without false work will doubtless bring about a further adoption of the type in similar situations.

Riveted Construction Extending

The violent controversy that was carried out a generation ago on this continent with respect to the comparative merits of pin-connected and riveted structures has quieted down, leaving each to its appropriate field. Only for the longest spans is the pin-connected type now adopted. Thus, the new Lachine bridge containing two 408-ft. spans and a large number of shorter spans is entirely riveted. The 644-ft. span of the Pennsylvania Railroad at Louisville, Ky., built in 1919, is also a completely riveted structure, and the new Michigan Central arch is to be riveted, except for the connections of the short verticals near the crown.

Choice of sections for trusses in steel bridges has fallen of late upon forms that yield the greatest possible efficiency of metal employed. Whereas in the old days a tension diagonal might consist of two channels latticed, in recent years a four-angle member with a solid web, having the troughs up and down, is generally adopted. There is a desire to make every pound of metal work and to reduce the percentage of details.

A remarkable modification in steel arch types has occurred in recent years through the construction of arches, first as three hinged, later to be converted into the two-hinged type. Thus the 505-ft. St. John highway arch, built in 1915, was built as a three-hinged type for part of the dead load and converted into a two-hinged arch for the remainder of the dead load and for the live load. A similar procedure was adopted for the 384-ft. Alaskan Railway arch over Hurrican Gulch, in 1921, and the same method is being adopted in the new Michigan Central arch at Niagara Falls. An interesting modification of steel arch construction has been made in the case of the 350-ft. Williamette River bridge, at Oregon City, Ore. This is essentially a fixed-end steel arch bridge with ribs enclosed inside and out with gunite. The latter is merely a preservative or protection against corrosive fumes and is not intended to carry stress.

No revolutionary development in the design of reinforced concrete arches has occurred in recent years. The trend is towards refinement of detail and perfection of thoroughly established types. For long spans, practice is agreed upon the permissibility of omitting rib reinforcement and upon the lack of necessity for permanent hinges. The hinge idea is essentially European and never made much progress in America. It is, however, useful as a temporary expedient in order to insure coincidence of the line of pressures with the middle third of the arch rib, and to make more suitable provision for temperature and shrinkage stresses. This, for example, was done in the Ashburnham bridge, at Peterboro.

Concrete truss bridges have given way in recent years to tied-in arches. Less than 15 years ago when the first concrete truss bridge was constructed in Canada, diagonals were employed, but recent practice has convinced engineers that these are not a necessity. Such may be easily perceived if one regards the concrete truss has an open-spandrel arch turned upside down. No system of diagonals is necessary between spandrel posts, and by analogy it is unnecessary to have diagonals in the so-called concrete truss bridge. This structure, therefore, becomes merely an arch rib with suspenders and with the thrusts of the rib taken care of by a horizontal tie between springings.

Arch Cantilever in Concrete

Some employment of the arch cantilever in reinforced concrete has been made in America as well as in Europe. The writer knows of at least fourteen instances of bridges of this type being constructed, or now under construction. Perhaps the most notable of the kind is the well-known Belle Isle bridge at Detroit, now being built. Structural steel reinforcement units of arch form with suspended spans are being erected on the piers to carry the weight of steel plus the concrete and the forms of the arch ribs. Additional weight is to be carried between the steel and the concrete in appropriate proportion. The only example of an arch cantilever structure in concrete being attempted in Canada, so far, is the Governor's bridge over the old Belt Line Railway, Toronto, which contains a 200-ft. central span acting chiefly on the cantilever principle. It is calculated primarily as a cantilever, but a small part of the load is transmitted to the earth by arch action.

The extreme upper limit of the concrete girder appears to have been attained in the two 142-ft. spans over the Salt River, in California, built in 1919. It is not at all likely that this limit will be disputed, since the use of a tied-in arch is in general more promising.

An interesting new type developed in connection with the crossings of certain roadways by the Bronx River Park, New York, is a continuous frame concrete structure resembling in outward appearance a flat arch. In reality, it is practically an inverted U with short legs so designed as to take the pressure of the earth against them.

Bridge design has been influenced to an important degree by the changes in standard bridge loadings occurring in the last few years. On highway bridges the motor truck or road roller has fixed the character of the concentrated loading. A 20-ton load is now considered to be the maximum probable one, although ten or fifteen years ago many prophesies were heard of 40-ton trucks on our highways. The impracticability of constructing roads for such enormous concentrated loads has resulted in corresponding relief in prospective expenditures for bridge structures.

Railway bridge loads have grown very much of late years and are still increasing. A generation ago an E35 or E40 loading was considered adequate, but in these days E60 has come to be regarded as the most usual loading for first-class railroads. In many cases important bridges are being designed for loadings of from E70 to E90. Much influence has been exerted on bridge design through the changing character of locomotives. The adoption of the Mallet type on certain divisions has been responsible for the incorporation of Steinman's M-loadings in the specification for steel bridges recently prepared by the American Society of Civil Engineers. Such an alternative loading will doubtless be employed on the railroads carrying the heaviest traffic, although for many years to come on the ordinary railroads, loadings of the Cooper or consolidation type will be more likely employed. So far as provision for electric locomotives is concerned, the Steinman or M-loadings will suffice.

Probable Span Limits

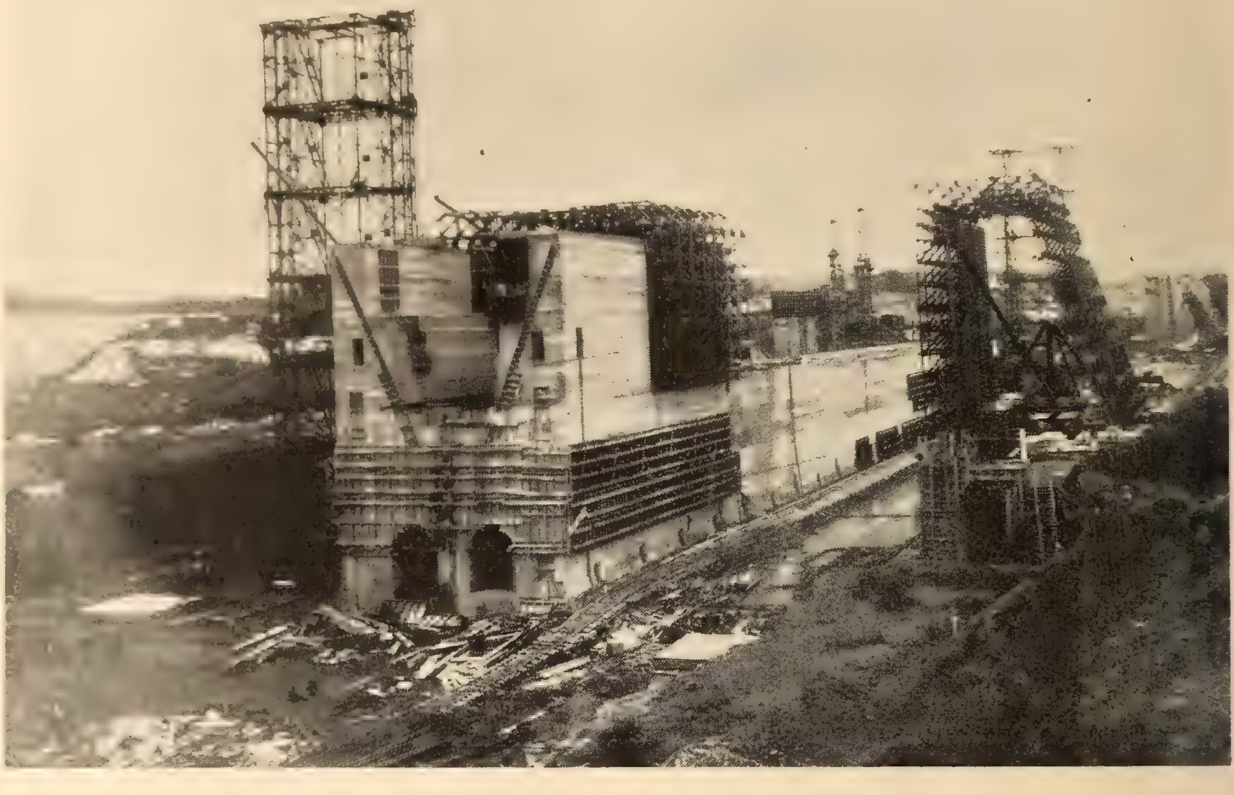
With the improvement of alloy and other high strength steels it is possible that simple truss spans will be pushed even above the record 720 ft. of the Metropolis bridge. Studies have already been made for such spans up to 800 ft., and with improved methods of erection, such are not beyond the bounds of probability. Continuous spans in excess of the 775-ft. spans or the Sciotoville bridge may be expected, although much controversy is waged over the suitability of the type. Some engineers object to them on the ground that maximum shear and maximum moment occur at the same section.

A very considerable advance is being made in span limits of suspension bridges through the construction of the 1750-ft. suspension bridge across the Delaware River at Philadelphia. This is based upon the use of wire cables, as is also the proposed 1632-ft. Bear Mountain bridge across the Hudson River. The Roundout Creek bridge of 705-ft. span, built in 1922, also makes use of wire cables. On the other hand, under certain conditions, eye bar cables are still being considered. Gustav Lindenthal adheres to eye bar chains for his North River Bridge of 3240 ft., and D. B. Steinman purposes to use this type of construction for the 1114-ft. suspension bridge at Florianopolis, Brazil.

Surprising developments may be expected in the span of concrete arch bridges. The writer has a list of twenty-nine such bridges of 200 ft. in span, or over. As is well known, the 400-ft. Cappelen memorial arch, at Minneapolis, is practically completed, and there is a 430-ft. arch now under construction at Rouen, France. Studies have been made for another arch of 542 ft. in France, one of 558 ft. in Sweden, and for the notable Hudson memorial bridge, in New York, of 703 ft. in span.

Collegiate and Vocational School for Kitchener and Waterloo, Ont.

This structure nearing completion is one of the largest schools in Western Ontario S. B. Coen and Son are the Architects



Lock No. 6, Welland Canal, showing Steel Forms in place

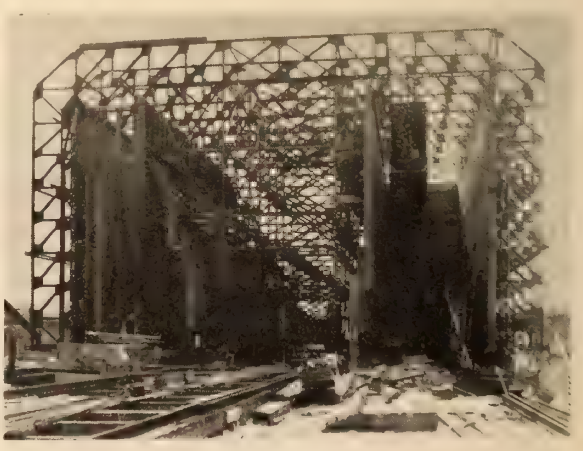
Immense Steel Forms Used on Welland Canal

One of the most interesting features of the work on the Welland Canal is the type of concrete forms used by the Peter Lyall Construction Company. These are the Blaw-Knox, heavy wall, steel type and are in use throughout on Locks 4, 5 and 6.

These forms were of course designed specially for this job and are of such a size as to admit of the pouring of a block of cement 60 ft. long and 39 ft. high in one continuous operation. The two forms shown in the larger illustration weigh 350 tons. They were made in Canada. This type of concrete form effects a very great saving in time. The forms operate on wheels, which guarantees speed and ease of movement. The company do not sell these forms outright; they lease them. This can easily be understood to be the logical course because new forms have to be made for every job of any considerable size.

The smaller illustration shows the forms in place before one of the pourings was started. The forms are suspended from the huge steel framework shown in the picture. The relative size of the structure may be gauged in comparison with the workmen seen in the right hand part of the picture. In actual fact this form is 39 ft. 6 in. high.

In addition to large work of the nature of the Welland Canal and the Montreal Aqueduct, where the same type of forms was used, Blaw-Knox forms are available for every type of construction. At the present time a very large percentage of the forms used by roadway contractors throughout Canada are of this type. In addition to forms the same firm manufactures the well-known Blaw-Knox clam-shell bucket for excavation work. The company is represented in Canada by Dominion Industrial Products Ltd., Ryrie Building, Toronto.



Blaw-Knox Steel Forms in place for pouring concrete on Welland Canal

The Contractor, the Architect, and the Public

Best Results Only Obtainable When There is a Mutual Understanding—Function of Architects Should be Clearly Defined

Co-operation is the Key Note of Good Building

By HERBERT HORNER*

System, organization and co-operation are each common enough words, and all of the greatest significance in everyday business and professional life, yet when there is a building to construct, the one that is paramount in importance is co-operation.

In the early days, when many beautiful structures were erected, the architect was then a master craftsman. He dealt personally with labor, directing and supervising the work. These buildings, although of simple construction, were nevertheless executed in the greatest detail, exquisite taste and excellence of workmanship.

As civilization progressed, the demands upon the architect grew, until he is asked to-day to design and supervise the modern building, highly specialised in every detail; of necessity he has lost much of the close personal touch that he had with the artisan of olden days.

What could be more complex than the modern building, employing every known material in some part or the other of the structure, requiring directly or indirectly the labor of every known trade, relying upon the latest scientific laws for its very existence, and the ideal building signifying a thing of beauty. This is the structure that the architect is asked to design and the contractor to build.

Function of Architect and Contractor

The architect's function is to plan the building, clothe it in suitable materials, decorate the interior with rare woods and marbles and so treat it that it may be one harmonious conception. It is his further duty to draw up specifications, so as to give the client value for his money and to see that these specifications are adhered to; in performing the latter service he frequently becomes an arbitrator between the contractor and the client.

The contractor, on the other hand, has to use all his skill and ingenuity in carrying out the plans and specifications and designing ways and means of overcoming the numerous engineering problems which arise from time to time. He has to deal with labor, which presents no small problem nowadays, and on his judgment to a great extent depends the class of workmanship that goes into the building. He has also to finance a considerable portion of the undertaking, and is always liable to financial loss through one or more of various conditions beyond his control.

The contractor, naturally, enters into a covenant with the owner to deliver a structure for the purpose of making a financial profit, and the architect has to bear this in mind, for it lies with him to a greater or lesser extent in his control of the work, supplying information, intelligent supervision and promptness in issuing certificates, to affect materially the amount of profit which the contractor may obtain from the given work.

The owner is generally an individual or corporation with little knowledge of the duties of the architect or of the building trades. The building, whether domestic, commercial or institutional, is of the most vital importance to him, and gets much of his personal attention. Matters of equal significance, which would ordinarily be left to his staff, are dealt with personally by him.

Instructions are given to his architect to prepare plans and specifications and to call for tenders, and it is in the awarding of the contract that the architect must see that fair play is given to all contractors submitting bids. After the work is commenced, upon the architect devolves the duty of supervising the construction, protecting the interests of his client at all times. He will be called upon frequently to act as arbitrator between the contractor and the owner, for the latter, due to his lack of technical knowledge sometimes makes unreasonable demands upon the contractor.

The architect must issue all certificates upon the owner promptly and do everything in his power to see that the same are paid within reasonable time. In dealing with the contractor, the architect must give full and sufficient information at the time required, in order that the work may not be delayed, for time means money to both the contractor and the owner and must settle without prejudice any difficulties that may arise as the work progresses. Since the architect receives his remuneration for services rendered, from the owner, he often finds himself in matters of this kind in an awkward position, for though it should not have any bearing on the case, it sometimes does. All of which goes to show that the architect has at times a difficult situation to handle.

The contractor has it in his power to deliver a building of the very finest workmanship and material, but, as the trade knows only to well, if the contractor sets out to beat the architect or his clerk of works, he can often do it. If this is his intention, the architect is put to a great deal of additional expense and trouble, and has to answer many unpleasant enquiries from the owner.

Effecting Savings

The general run of plans leaves many things to be desired, and the contractor will often be called upon during the course of the work to consult and often advise the architect regarding the problems which arise from time to time. If this is done in an interested manner, the architect may often save additional expense to the client, and indirectly benefit the contractor.

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*Sharp and Horner, Architects, Toronto.

Probably, there is not in the whole business world a case in which two men are brought together to carry out an undertaking where co-operation ought to exist to a greater extent than between the architect and the contractor, and unless there is co-operation and a complete understanding, it is impossible to obtain the best results.

In closing, one of the finest tributes that could be paid to any architect, and one that showed the hearty co-operation existing between architect, contractor and owner, was witnessed at the largely attended funeral service of the late Mr. Frank Darling at St. James' Cathedral, when artisans, contractors educationalists and financiers sat side by side to do honor to his memory. This is merely significant of the fine character and sterling qualities of a man who, the acknowledged head of his profession, could command the respect of owner and contractor alike.

The Architect, the Contractor and the Public

Toronto, May 23rd, 1923.

Editor, Contract Record:

You have asked me for my views on possible closer working relationship between the architect, the contractor and the public, all of which are represented, or should be represented on all construction work.

First of all, it seems to me a very unfortunate thing in the Dominion of Canada, and more particularly in the province of Ontario, that the public does not seem to have a proper conception of the services which can be rendered by a highly trained, efficient architectural firm in the erection of buildings. Perhaps there is a good reason for this, and I am inclined to believe that the reason lies with the architects themselves.

We all know that the medical profession, the legal profession and others stand a great deal on their dignity, but the general public despite this atmosphere, must perforce go to the medical profession and the legal profession when they get themselves into trouble. On the other hand, the general public seems to think, wisely or unwisely, that they do not need perforce to go to the architectural profession, and this, I think, is the basic difference which is not quite recognized by the average architect.

Talking from twenty years' experience, half of which has been spent in the contracting field and the other half in the architectural field, let me say most emphatically that the services rendered by an efficient architect are well worth the price paid for them; and let me say also just as emphatically that the services rendered by a poor architect are worse than useless and the money paid for them is utterly lost.

Not Enough Architectural Service

From the contractor's point of view, I have always found it very poor policy to attempt to render a service as a contractor which normally is within the province of architectural service, but again talking as a contractor, I have found it very difficult to obtain architectural service on a proper financial basis. The attitude of so many architects seems to be that once their name is connected with any building, they must control the entire operation and receive their standard commission. In a great many cases a contractor could utilize the services of an architect in his day-to-day operations on construction work which has been designed by engineers and others with no architectural training or feeling in their make-up, but to ask an architect to help out in work of this kind and receive for his services fees that will cover his costs with a reasonable profit, does not seem to be proper in the eyes of the profession, and consequently it is not done.

We have in this City hundreds of industrial buildings, erected without architectural service, the buildings being designed by engineers, or designed and built by contracting engineers; buildings on which if $1,000.00 had been spent on architectural advice, the results would have been very beneficial, but again it is not proper and it is not done.

If we go to the outskirts of the city we see hundreds upon hundreds of residences, small stores, etc., where architectural services has never been dreamed of, and one's eye need not be trained to tell this. If, for example, we drive down Danforth Avenue in the city of Toronto, we will see hundreds of these little buildings, and some bigger buildings thrown in, where there has not been the slightest intelligent effort to erect structures pleasing to the eye and with proper architectural lines; where no effort has been made to combine materials in a proper architectural group, and where everything has been sacrificed in order to get a cheap quick job. Then suddenly you will come on the south side of the street to a large imposing industrial building where an architect has been empolyed. The difference is very striking. The building in question is simplicity itself; not a cent has been spent in unnecessary ornament, and yet the building stands out in a most dignified way giving very forcibly to the public the lesson I am trying to convey here.

What we need in this country is real architectural service which is worth to the owner every dollar that he pays for it, a proper understanding by the public that real architectural service is worth paying for, and the result would be more economical construction, and a much more dignified looking city.

Yours very truly,
J. B. Carswell*.

Town Planning of Waterloo

Mr. Horace L. Seymour, C.E. (Tor.), A.M.E.I.C., and member of the Town Planning Institute of Canada has just entered into a contract with the Town Planning Commission of the Town of Waterloo for the preparation of a town planning scheme and maps showing proposed ultimate development. Special attention will be given to the matter of zoning. Every endeavour will be made to have the work completed this year.

The work at Waterloo will be carried out in conjunction with the plan being prepared of the neighboring city of Kitchener in which work Mr. Seymour is associated with Mr. Thomas Adams, of London, Eng., and Ottawa, past president of the Town Planning Institute of Canada.

Mr. J.E. Hollaman, A.M.E.I.C., and associate member of the Town Planning Institute will have charge of the preparation of the maps, in which work he has had important experience.

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*Carswell Construction Co.

Canadian Section of the A.W.W.A. Discusses

Problems of Waterworks Operation

Municipal Engineers and Water Works Officials Meet for Two Days in Windsor Prior to the Detroit Convention of the Parent Association

The convention of the Canadian Section of the American Waterworks Association opened on the morning of May 19, at Windsor, with a representative gathering of municipal engineers and waterworks men in attendance. Mr. R. L. Dobbin, Peterboro, occupied the chair.

The first item on the programme was the presentation of reports of committees. Under this head were certain recommendations with reference to "Fire Hydrant Nozzle Threads," based on a paper read by Norman R. Wilson, of Brantford, at a previous meeting of the section.

"The Operation of Rapid Sand Filtration Plants" was the subject of a most interesting paper by Mr. W. D. Hatfield, superintendent of filtration for the city of Highland Park, Mich. Mr. Hatfield's remarks are printed elsewhere.

At noon the members of the Canadian Section and visitors were the guests of the Windsor Water Commission and the Walkerville Water Company at a luncheon held in the Prince Edward Hotel.

The afternoon session opened with the election of officers, which resulted as follows:

Chairman, F. A. Dallyn, Toronto; vice-chairman, N. R. Wilson, Brantford; secretary-treasurer, C. D. Brown, Walkerville; trustee, D. M. Hanna, Windsor.

The presentation of resolutions was next in order. The following, with regard to place and time of meeting, which were circulated among the members previous to the convention, was carried:

* * *

RESOLVED that Article 6, Section 1, be and is hereby amended to read as follows:

The Annual Meeting of the Section will be held on such days in the months of February and March as the Executive Committee may designate.

The place of meeting shall be that designated by the members of the section at the previous Annual Meeting, the selection to be by ballot. The place receiving the majority of votes cast shall be selected as the place of meeting. All members whether active or associate shall be entitled to vote.

The Executive Committee shall have power to change the place of meeting, as in its judgment the interests of the section demand.

Should the above resolution carry, it is understood that the officers elected at the Annual Meeting in Windsor, May 19, shall hold office until the following Annual Meeting.

* * *

A resolution was also brought forward proposing the establishment of a separate district for the Canadian Section. This was afterwards placed before the A.W.W.A. in convention in Detroit.

The final item of the day's program was a paper on "Stand-by Units for Pumping Stations and Operating Costs," by Mr. E. M. Proctor, which was printed in last week's Contract Record.

The proceedings were continued on the morning of Monday, May 21, Mr. Norman R. Wilson presiding, in the absence of the chairman-elect, Mr. Dallyn, due to illness. Mr. Thomas Hodkinson, of London, Ont., who was to have opened up a discussion on "Mains and Service Installations" was, unfortunately, absent and unable to contribute, owing to illness. Mr. R. H. Starr, of Orillia, Ont., however, took up the question in a brief but comprehensive manner, outlining the methods used in his municipality.

Mains and Service Installations

By R. H. STARR*

With usual extensions which crop up from time to time in Orillia we insist that a percentage of the estimated capital cost shall be returned each year in the revenue from this extension. In the past this has been 10% but I feel that this is quite inadequate to meet the cost and we are considering changing this to possibly 20%. That is to say, if we lay 1,000 feet of main together with services at, say, roughly $1,500.00 we would have to have a guarantee, under prevailing order, of $150.00 per annum, either at the usual rate or by increasing proportionally. We have always used class "C" cast iron pipe with the exception of one spot on a hill where class "A" was put in and in another case in the factory district, upon making an extension we came across a block of 4″ cast iron soil pipe. This had been made by welding together three 4′ lengths to make one 12 and then caulked and leaded in the usual manner.

After the preliminary work is done in connection with the extension we give a work order to the foreman covering the main together with a work order for each service. These work orders state the size of pipe to be used and describe the fittings and valves and hydrant locations.

The mains are laid approximately 22′ from the street line with the valves placed on the street line of the intersecting street. In cases where the block exceeds 400′ we place one in the centre as well. Our service pipes since I took over the work have all been laid with ⅝ x 9 lb. lead or 1″ x 13 lb. Care should be taken to see that such lead pipe has a uniform wall, not thick on one side and thin on the other. We have not had to renew any lead pipe of this weight laid in my time but have trouble with lighter weights mainly due to the fact that they had one thin wall on one side of the pipe.

We use a standard main cock for use with a Mueller tapping machine, and where the service is on the same side of the street as the main we use [illegible] pipe for all ordinary houses. If there are two houses close together on the opposite side the general practice is to use 1″ lead pipe with a special brass "Y" leading off same with two ⅝″ service connections.

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*Engineer, Orillia Water, Light and Power Commission.

Many of the "Y" branches advertised in the various corporation goods catalogues are not suitable as the inlet has the same throat as the two branches. We have been able to secure the type we required from the Canadian Brass Company.

The curb cock is placed 8 feet from the street line with a standard box and the service continued to the street line. This part is all put in by the commission without any charge to the owner. In a lot of smaller houses where they only require an outside tap, it has formerly been the practice to use an anti-freeze type with riser and two elbows and a nipple but we found this type causes an excessive water hammer and for the last three years we have insisted on a lawn hydrant which can be bought for about $7.50 and which we give to the customer at our laid down cost exclusive of overhead.

Some of our valves on the main have got ordinary standard iron valve boxes but these we find are very impracticable for repair or renewal of the packing of valve, and we now have standard wooden forms made up and make all our valve boxes of concrete with cast iron cover. The covers are made heavy enough so that vehicles passing over will not disturb it. We use lead flange unions in all cases in preference to wiped joints, as one is more or less dependent upon skilled labour for wiped joints whereas the ordinary labouring man can use the lead flanged joints.

We have always used lead and oakum, the Commission operates both the electrical and waterworks system and we use electricity for thawing services. I am given to understand that leadite is a nonconductor (electrical) and if we used same for joints we would have some difficulty in making our connections for thawing purposes. We laid one hundred tons of pipe last year and did not have a leak.

With regard to meters our experience is limited. We only have about thirty, and in some cases where the people have a cellar there is no means of heating it, such as garages. We have found it more satisfactory to build a concrete pit on the boulevard the same size as our valve boxes and install our meters in them, using false board covers one foot below the ground.

* * *

There was some interesting discussion on Mr. Starr's paper. The question was asked as to how many valves were used in a section. Mr. Starr replied that his practice was to use four, and in installing hydrants it was always endeavored to place them within the limits of these four valves, so that if one section of the main was out of commission, the hydrant would still be in service. In very few cases were separate valves used.

One of the delegates made reference to the ⅝" minimum service connection which Mr. Starr had said was used in Orillia. He thought this minimum was unnecessarily high, and in his municipality they used ½" pipe throughout for service extensions, which he found quite adequate.

Mr. Starr disagreed with this. Five-eighth inch pipe was the very smallest that he thought could be satisfactorily employed, and he cited the case of a 30-room hotel in his town where a 1" service had proved scarcely sufficient to meet the requirements.

A question was asked by Mr. Keith, as to the method of financing, in reply to which Mr. Starr stated that the town paid the whole cost as far as the street line. If there was a leak at the street to be repaired, he did not think it fair that the resident should be asked to bear the cost.

There was considerable discussion as to the most equitable and practicable methods of assessment. Mr. Turner, of Edmonton, Alberta, declared that he believed that the system used in California for the financing of water service in new subdivisions was the best that had come to his attention. Down in that state, there was a regulation that the real estate promotors responsible for the opening up of these subdivisions must pay for the installation of water mains, curb and gutters, catch basins and sewers.

Mr. Turner stated that he was taking action to have the matter brought up in the Alberta Legislature, with a view to having regulations of this character introduced. He also pointed out that at the present time in the city of Edmonton, a zone system was used with different rates applicable in each of three zones. The object held in mind was to help concentrate the city, and prevent its scattering over too wide an area.

It was pointed out by one of the members that a measure similar to that referred to had been brought up in the Ontario House, but it had been thrown out, strong influence having, of course, been brought to bear by the real estate interests.

After some discussion, it was suggested that Mr. Turner might present his viewpoint in the form of a resolution recommending that legislation be introduced in all the Provincial houses to provide that the real estate promotors should bear the costs of such services as water, curb and gutter, etc., in new subdivisions. Mr. Turner complied, and it was decided to refer the resolution to the incoming executive for consideration and action.

Following along the subject of charges for service, Mr. Scott, of Galt, outlined the provisions of a by-law which had recently been passed in his city. A few years ago, he said, they had made a large extension, from which revenue was found to be quite inadequate to cover the cost, and to overcome this difficulty a by-law was introduced which permitted the application of a frontage charge. This method of assessment was only used in cases where the revenue thus derived would be larger than the usual water rates, and was a protection where a property owner with a big frontage used little or no water. This frontage tax was at the rate of 6 cents on each side of the street and was applied to all property that was not improved. If a man had a garden or lawn on such property, however, he was charged the garden rate. One difficulty they had had was where a citizen owned a house in the city and perhaps some vacant lots on the outskirts, the contention had been made that the charge should be based entirely on the frontage basis, or else that it only be the usual water rates should be paid. However, they had taken the matter up with a high legal authority, and his ruling was that in such instances the charges should be applied separately—that is, that the citizen must pay water rates on his improved property, and frontage tax on his vacant lots.

* * *

Pumper vs. Pumping Station for Extinguishing Fires

A comprehensive paper on the above subject was read by Mr. J. A. Jensen, of Minneapolis, Minn.

Mr. Jensen's remarks brought forth considerable discussion: Mr. Frank, of Brantford, raised the point that the provision of high pressure at the pumping station for fire protection purposes was not fair to the citizens generally, inasmuch as it involved considerable extra costs and caused considerable leakage, etc. His contention was that the pumper should be depended upon to supply this extra pressure.

Following along the same line, Mr. Gore, of Toronto, made reference to an actual test which had proved the great economy of the pumper, as compared with the provision of the high pressure throughout the system. It might be taken for granted by some that leakage would increase as the square foot of the pressure—but as a matter of fact leakage increased at a much greater rate than the pressure. This fact had been demonstrated by a night test made in Toronto. During one hour the flow in the sewers was found to have unaccountably decreased by one half. Later investigation proved that this had been due to the shutting of one of the pumping plants, which had lowered the pressure in the mains approximately 20 lbs. per sq. inch and thereby reduced the leakage to such an extent that the outflow was halved.

The place of meeting of the next convention was brought up, and after discussion Hamilton was decided upon.

A letter from Mr. F. A. Dallyn was read by Mr. Dobbin, expressing regret at his inability to be present owing to illness.

Mr. Dobbin moved a resolution of appreciation of the hospitality and courtesy of the Windsor Water Commission and the Walkerville Water Company, Limited.

A vote of thanks to Mr. Jensen for his paper was also heartily carried.

The afternoon of Monday was spent on a motor trip to points of interest within the Border Cities.

A Non-Technical Description of
Rapid Sand Filtration Plants

An Explanation of the Chemical Theory Governing the Treatment of Water in Mechanical Filters—Operating Requirements —Desirability of Expert Superintendence

By Wm. D. HATFIELD
Supt. of Filtration, Highland Park, Mich., before Canadian Section, A.W.W.A.

First I must describe the general outlay of a rapid sand filtration plant and the steps in the purification. Naturally the first step is to get the raw water to the plant. In some places it is possible to run the raw water to the plant by gravity, but usually it is pumped into the chemical mixing chamber by what we call low service pumps. In some places where the water is heavily laden with silt it is first settled in a reservoir to remove this heavier material before the water goes to the mixing chamber. As the raw water enters the mixing chamber a solution of the correct amount of aluminum sulphate is usually added and mixed with the raw water by passing around, over and under baffle walls. In some cases iron sulphate and lime are used instead of aluminium sulphate. This mixing process usually lasts from 15 to 45 minutes, and in that time the chemical has got a good start toward bringing the dirt and bacteria together in groups. After leaving the mixing chamber the water flows slowly through the coagulation or sedimentation basin in which the groups grow in size and about 75 per cent of them settle out carrying with them most of the dirt color and bacteria. The time of sedimentation varies in different plants from two to eight hours.

This coagulated and settled water then passes through the sand filters which remove the remaining amount of added aluminium, turbidity, and practically all the bacteria. The water in the process of filtration passes down through from 20-30 inches of filter sand and then through from 12-24 inches of graded gravel; the small gravel first and the larger gravel last. The filtered water is collected in the bottom of the filter in a net work of pipes into which are inserted brass strainers or only small holes. The filtered water then flows through rate controllers which keep the filters operating at a constant rate of flow or within certain limits of allowable flow. This control is necessary or the clean, freshly washed filter will allow the water to pass too fast for efficient filtration. From the rate controllers the filtered water passes to the filtered water reservoir usually called the clear well.

The "Safety Valve"

In a properly designed and operated plant this filtered water should be safe to drink, but we have a very effective "safety valve" in the use of liquid chlorine which sterilizes the few bacteria that may slip by the filtration process, and the cost of such treatment is so small that we cannot afford to be without its added protection. The chlorine is usually added to the filtered water as it flows to the clear well or into the suction of the high service pumps leading from the clear well. However in some cases it has been found most efficient to add the chlorine either before the alum treatment or just before filtration.

The high service pumps are the last step in the filtration plant proper, for after that it is purely a matter of distribution of the tap water.

In as non-technical a way as possible I will now try to explain the "How and Why" behind the chemistry of the treatment with aluminium sulphate. As rain drops pass through the air they dissolve, among other gases, carbon dioxide, and as it runs off, and through the ground it picks up more of this carbon dioxide which is a decomposition product of both animal and plant life. This rain water containing the carbon dioxide has a dissolving action on the different forms of lime stone in the earth. This dissolved lime stone that exists in natural waters is called, by the chemist, calcium and magnesium bicarbonate, but we will call them the alkaline salts because they make the water alkaline.

When the chemical, aluminium sulphate, is added to this alkaline water the aluminium and the alkalinity unite to form sticky white masses throughout the water. This is called the "floc" by the operator, aluminium hydroxide by the chemist, and resembles the white of a soft boiled egg. This sticky white material which at first forms in millions of minute particles throughout the water, sticks to the dirt and bacteria, and as these particles come together they stick to each other forming larger particles, 75% of which become so heavy that they settle out in the settling basin before the water reaches the filters. The settled water as it goes on the filters carries the remainder of this sticky material which then forms a sticky blanket on the surface of the sand. It is this sticky blanket through which the settled water filters that remove the last traces of the added aluminium and dirt or turbidity from the water; it also removes practically all the bacteria. Without this sticky blanket on the sand the turbidity and bacteria removal would be very poor.

The Floc

From time to time since treatment with aluminium sulphate began we have had agitation regarding aluminium getting through the filters in a soluble form. In all probability if part of it did get through one would have to drink a barrel of water to get a medicinal dose, and it is doubtful if aluminium has any physiological effect at the concentrations used in water purification. However we need not worry about this, for results on plant operation show that within a wide range of treatment the added aluminium is not only all removed but also some of the naturally dissolved aluminium which was already in the raw water is removed. If the treated water is too acid or too alkaline the aluminium floc is soluble, but this zone of insolubility between the "too acid" and "too alkaline" points is very broad in many surface waters, and the operator of a plant would be pretty inefficient if any aluminium gets into the filtered water. Some soft waters do not contain enough of the alkaline salts to react with the amount of aluminium necessary to clarify the water. In these cases artificial alkalinity must be added by using lime or soda ash.

In the operation of a filter plant close observation must be kept on the quantity as well as the quality of the raw water used. If the plant is designed with a relatively small clear well the only safe method of operation is to keep the clear well full at all times. This necessitates changing the rate of flow of the raw water, and rate of filtration, to parallel that of the high service pumps, and means a close watch on the alum dosage which must be changed with each change of raw water rate. It is much more satisfactory and convenient to have a larger clear well so that it can be allowed to drop a few feet during the day and catch up during the night. In such a case the raw water rate and chemical treatment can be kept relatively constant for long periods of the day.

Adding the Chemicals

There are two common methods of adding the chemical. The older method is to dissolve a known amount of the alum in a tank of water of known capacity and to run this solution through an orifice into the raw water. The newer method is to add the dry ground alum by means of machines which mechanically drop a known quantity of the chemical in running water which dissolves it and carries it to the mixing chamber. The machines may be checked for delivery by holding a container under the machine and weighing the ounces of chemical delivered per minute. This method is much more accurate and satisfactory than the former method. The amount of alum necessary to coagulate a raw water must be determined by an experienced man. This amount is dependent on the alkalinity, turbidity, bacterial pollution, and the much talked of hydrogen ion concentration. The chemical feed should be checked up hourly in any plant.

As the floc blanket builds up on the filters it gradually clogs the sand surface and decreases the pressure of the water flowing through the beds. This decrease in pressure is called loss of head, and will continuously decrease while the filter is in operation. When the loss of head has reached a certain predetermined point which varies from 4 to 12 feet on different filters, the filters must be washed. Washing the filters when the loss of head reaches a certain point is the usual method, but recently some operators have been running the filters until a very slight turbidity comes through regardless of the loss of head. The amount of wash water will vary from day to day but will usually average from 0.5 to 3.0 per cent of the total water filtered.

Hours of Service

The hours of service which a filter runs before it must be washed is an important item because it shows the efficiency of the chemical treatment and of the sedimentation. A plant should always run so that the coagulation and sedimentation does most of the work and the filters only finish up the job. Hourly records should be kept of the filter operation.

In most cases the filtration process as a whole should always be operated so that the filtered water is satisfactory for drinking purposes, but even where this is possible the filtered water should be chlorinated with a minimum amount of chlorine to sterilize any bacteria which might slip through the process under some extraordinary condition as I have said above. This chlorination is our safety valve and a very valuable one, but like a safety valve it should be there only for the unusual occasions and should not be relied on to do the work of the filtration process.

Needs Expert Attention

It is easily seen that water treatment is a chemical process and that laboratory control would be essential to efficient operation. It is too bad that in so many cases cities will build expensive plants and then fail to economize by running the plant without the trained supervision of a chemist or a sanitary engineer that thoroughly understands the chemical side of operation. Laboratory control tells us the quality of the raw water, the efficiency of coagulation, sedimentation, filtration and chlorination. The number and kind of chemical and bacteriological determinations necessary at different plants will vary greatly. With one water certain tests will be absolutely necessary while with another other will be of more value; for example I have never heard of a plant where the determination of dissolved oxygen or air in the water was of any value until I took charge of the Highland Park Plant. At certain times of the year this is the most important test we make for the efficient operation of the plant.

Perfecting the "Push Button" Control Freight Elevator

Among some of the modern interesting developments in vertical transportation equipment which has come to our notice is the recent perfecting of a "Push-Button" control freight elevator by the Otis-Fensom Elevator Company. This new equipment replaces the old-fashioned and cumbersome "hand rope" method of control too long tolerated as the method of operation of freight elevators. In their new "Push-Button" Control, this company has accomplished the production of a mechanism in which ease and safety of operation has been carried to a very fine point indeed. This new type of elevator is controlled as easily as an electric light with a button switch on the wall. Operating buttons are provided in the car and on each landing and the simple pressure of the finger on the proper button operates the car in the desired direction. The releasing of the button brings the car to rest. The car is readily levelled with the landing by momentary pressure of the button.

Some of the features embodied in this type of control are worthy of notice. The car cannot be operated unless all the gates are closed and the gates themselves are automatically locked when closed unless the car is at the landing. The operator in the car has full control of its movements without interference from operators at any landing. When not in use the car can be brought to any landing by pressure of the button at the landing and there is no limit to the number of call stations which can be provided. Every opening on the hatchway can be furnished with an operating button.

Installation

Don't Reach for the Hand Rope

The installation consists of an electric motor-driven winding machine of the "single wrap traction" type, arranged for over hatch installation, to operate on either direct, or polyphase alternating current; a controller for closing and opening the main line circuits to the motor through electro-magnetic switches—"up," "down" and "stop" push buttons in the car, and "up" and "down" push buttons at each landing entrance; car; counterweight; and necessary car and counterweight guides in the hatchway. No sliding contacts or other easily deranged devices are used in the controller. The current is gradually admitted to the motor and the car is started and stopped without jar or shock.

The controller is designed to afford protection against reversal, no voltage or open circuit on the power supply line. These features are very essential in alternating current equipment, eliminating as they do any danger of reversal of motor direction, or roasting out of motor due to open circuit on one phase. The brake is electrically released and applied under positive spring pressure and current interruption does not prevent its effective application. The car is substantially framed of steel members, proof against atmospheric changes. Standard sizes 5 ft. x 6 ft. and 6 ft. x 7 ft. are in effect though special cars can be furnished if desired. Automatic stopping switches are provided and arranged so that they will be opened by the movement of the car at either terminal, bringing the car to rest automatically at the extreme limits of its travel. A locking switch is provided in the car, this switch upon being opened by the operator cuts off the current supply to the motor and prevents the calling away of the car to any other landing. The elevator is provided with Otis-Fensom hatchway gates of the manually operated type. They are so counterbalanced that they will remain either in the open or closed position as desired. The gates are equipped with electric interlocking contacts designed to prevent the operation of the car when any gate is open. They will not allow the car to be moved when all gates are in a closed position. When closed the gates are locked and cannot be opened unless the car is at the floor.

Just Push the Button

A very comprehensive descriptive booklet dealing with push-button control elevators is just off the press and copies are available upon request from the Otis-Fensom Elevator Company.

Curb and Gutter Forms

The Heltzel Steel Form and Iron Company, Warren, Ohio, are distributing an interesting folder on "Steel Curb and Gutter Forms." The folder is very thoroughly illustrated, showing the various forms and exactly how they are used.

Hagersville, Ont., an Active Crushed Stone Centre

A Short Description of the Equipment and Facilities of One of the Three Aggressive Companies Operating There

With an ideal commercial location in the Hagersville stone district of Ontario, the plant of the Hagersville Crushed Stone Company, near the town of Hagersville, Ont., has enjoyed a rapid and extensive growth since its establishment in 1910. The lines of the Michigan Central and Grand Trunk railways serve the plant and with the connections which these lines have with the C.P.R., T.H. & B., L. E. & N., N. St. C. & T. and many other steam and electric lines, excellent shipping facilities to all parts of the province are provided, a feature of utmost importance to the successful operation of a quarry plant. The plant is also easily accessible to trucks, being located on the Jarvis-Hamilton division of the provincial highway system.

The present company, under the management of Mr. R. Hambleton, was organized and commenced operation in 1910, with one crusher a Gates No. 5, operated by a 65 h.p. steam plant. They added, the following year, a No. 4 Austin Gyratory crusher and in 1916 a No. 8 Austin Gyratory crusher, to their equipment, the latter item increasing the capacity of the plant by 800 to 1,000 tons a day. In addition to the crushing equipment as outlined, the present plant includes: two large screens, revolving type, of capacities equal to the crushers; two elevators; 75-ton Marion steam shovel, for loading in the pit; two modern Sanderson-Cyclone electric blast hole drills; Alley & MacLellan air compressor, imported from Scotland, with a capacity of 400 cu. ft. per minute, which supplies compressed air for the Sullivan hammer drill, and other small drills. The electrical equipment includes a 100 horsepower Westinghouse motor for operating the No.8 crusher; a 75-h.p. C.G.E. general purpose motor, a 50-h.p. C.G.E. unit for the compressor and several smaller motors for the operation of drills, well pump, etc. The plant has a bin capacity of 16 cars, approximately 800 tons, loading on two tracks.

There are no unusual features involved in the actual handling or treatment of the stone, the methods being similar to those employed at other large plants throughout the country.

The pit face is of a practically uniform depth of 28 ft. at which depth the utilization of the electric blast hole type of drill is especially adaptable for

Four views of the Hagersville Crushed Stone Co's. plant economical operation. The stone is of an even quality, light blue in color, from the top to the bottom strata and the owners claim it has proven by government test to possess the qualities of hardness, toughness, excellent keying value and a low percentage of water absorption.

This company is fortunate in not being hampered with usual problems of pit drainage, which, almost invariably, must be taken care of in quarry plant operation, the pit possessing a natural gravity drainage by reason of its geographical location. In addition to the saving in actual pumping equipment and operation, little detriment is offered to the carrying on of the work in rainy seasons. As a matter of fact this peculiarly happy condition allowed year-round operation of the plant in the years of 1920, 1921 and 1922, when comparatively open winters were experienced. The company state they have not had a pump in their pit for the past ten years. As will be seen in the accompanying photographs, another advantageous feature is the location of the plant in close proximity to the pit, allowing for a minimum handling of the stone from the pit to the crushers.

There are a staff of 35 men employed on the various operations. The company has established a camp on the site for the accommodation of foreign labor.

The excellent quality of stone from the Hagersville district is generally recognized and stone from this particular plant has been successfully used in the construction of several of the province's fine highways and structures, including the Port Dover-Simcoe road, several of London's city streets, a considerable mileage in Welland County and adjoining counties and has been used for the new roadways in Victoria Park, Niagara Falls. This stone was was also used exclusively on the large steel plant contract completed a few years ago at Ojibway, Ont. The company have several contracts on hand for the supplying of stone for municipal and government work this year and are looking forward to the busiest year in their history.

Hitherto they have not maintained a permanent stock pile, but propose establishing one in the near future.

The offices of the company are on Main St., Hagersville, Ont., and Mr. R. Hambleton, the founder of the business is manager.

The Brick Situation and its Relation to the Building Industry

The year 1922 was more satisfactory in the brick industry than a number of previous years. It is quite impossible to obtain satisfactory statistics on the production of brick, because there are so many small plants over the country where the distribution is merely local, but it is probably safe to say that it was 20 to 25% higher in 1922 than in the previous year or for many years. Owing to the nature of the building business which makes brick-laying a seasonal occupation to a very considerable extent, the prices of labor and materials are both higher than they might be under an all the year round demand. If we could only get over this bugbear of seasonal occupation, if our contractors could arrange to carry on during the winter months—or the less severe of them—and if the general public could be convinced that this is possible, then labor could afford to take a lower wage and suppliers of all kinds of material could readjust their organizations and spread their overhead over a much longer period. This applies to bricks, perhaps more than to most of the other building materials.

The 1923 demand promises to be considerably in excess of the 1922 requirements. At the present time the demand is doubtless exceeding production as well as the delivery capacity and it is a fortunate thing that many builders were foresighted enough to secure delivery of a fair percentage of their requirements earlier in the season. This practice might well become a custom among builders, for it can be definitely shown the customer that by planning, buying, and obtaining delivery in advance, the cost of construction can be materially reduced.

A real difficulty in the brick industry is the cost of delivery and the length of time required. Even if the works are operated through the winter, the bricks have to be stored. If they could be delivered, it would relieve the situation very much. It is one of the worst conditions associated with the building and construction industry, and it seems to be an inherent condition, that the letting of contracts is delayed year after year, well on into the summer. The present year is no exception. We are at the end of May and there are hundreds of contracts for which, to all appearances, the money is provided, but contracts have not yet been let. Some of the Governments seems to be at fault in this direction, and without doubt cost of work is very much increased by this delay. If contractors are keeping their organizations together during the early months of the year in the anticipation of contracts later on, it is evident that the extra expense involved must be borne by the work which is finally undertaken.

This delay in letting contracts is particularly hard on the brick industry. For example—the contractor knows that certain work is projected and anticipates that of a certain number of jobs he will be able to secure his share. Acting on this supposition he places an order for brick with the brick manufacturer. He is unable to take delivery however, until his contracts are signed, thus holding everything up. Then all the jobs come along at the same time in the middle of the summer, the demand for materials, including brick, is abnormal, and the delivery is correspondingly slow. The contractor is not entirely to blame. It is often difficult to carry out the contract between the contractor and the brick manufacturer, or the manufacturer or wholesaler of other materials, when prices have changed in the meantime. If prices have dropped, the contractor generally demands consideration. If they have gone up, he is very loath to pay the increase.

Brick manufacturers tell us that one of the most serious difficulties they have to contend with has been the extended terms taken by the builders, without previously arranging for same. They claim that it is impossible to get a financial statement from 90% of the builders doing business and that most of them refuse to submit a statement of their affairs. It may be that a large number of builders do not keep sufficiently detailed accounts of their operations to know exactly where they do stand. If this is the case, it is unfortunate for them as well as for the rest of the industry. A system of book-keeping by which a man simply knows whether or not he has made any money during the year, by the pressure of his accounts at Christmas time, is far from satisfactory.

When we can devise some means of producing continuity in the building and construction industry—a less feverish activity spread over a longer period—we shall have solved, in large part, many present day problems. Particularly would it have a direct bearing on cost of materials, cost of labor and alternate labor shortages and unemployment. The brick industry would profit, perhaps, most of all.

Joins Pacific Coast Pipe Co.

Mr. J. B. Holdcroft, A.M.E.I.C., registered Professional Engineer (B.S.), has recently accepted the appointment of hydraulic engineer on the staff of the Pacific Coast Pipe Co. Ltd., Vancouver, B. C., well-known all over Canada as builders of Wood Stave Pipe. Mr. Holdcroft will assist Mr. H. C. James, who has been associated with the company for the past fifteen years and during which period he has paid many visits to Eastern Canada in connection with hydro-electric installations. Mr. Holdcroft is well-known to readers of the "Contract Record" through his technical articles in this paper. Mr. Holdcroft has been specializing in hydraulic engineering in Western Canada for a good many years, and was connected with early investigation and surveys which culminated in the construction of the Sooke Lake waterworks at Victoria, B.C.; later he was assistant engineer in charge of the sewage department of that city during which period well over $1,000,000 of extension and new district systems were being designed and under construction. Later, he was in private practice in Victoria and Vancouver, B. C., and western manager for the John Galt Engineering Co. Since the war, during which he was in military service, Mr. Holdcroft has been for a considerable period engaged in hydraulic work on the head office staff of the Pacific Great Eastern Railway acting as engineer-in-charge of a hydro-electric power development and water supply system for its southern terminal—the town of Squamish, B. C. After this he was again in private practice handling work of various kinds, including a number of small power and lighting schemes. During 1922 he was engaged as engineer on design of the Oak Grove project, of the Portland Railway Light & Power Co., Portland, Oregon; a development which will total over 100,000 h.p. in three units, and represents an expenditure of above $12,000,000; this oppointment was held until he left to take up his present work.

Mr. George Oakley, Jr., manager of George Oakley & Son, builders' supplies dealers, has been nominated Conservative standard bearer in Ward 2, Riverdale, Toronto.

The Godson Home Building Co., of Toronto, have moved their offices from 172 Colbeck to 39 Woodsides Ave.

Mainly Constructional

East and West—From Coast to Coast

All legal obstacles have been removed states a report from Windsor, Ont., and plans for the extension of Windsor's hydro-operated street railway system will be proceeded with. The work will cost in the neighborhood of $1,000,000.

Arrangements are under way, according to a recent report, for the establishment by a Pittsburgh stucco company of a branch plant at Sarnia, Ont., where they will also manufacture marbleloid flooring for office buildings, churches, schools, etc. A site has been secured by the company and final arrangements are expected to be completed shortly.

Masons and bricklayers at Quebec, P. Q., have returned to work, after a lay-off of two weeks, at the old rate of wages. Employers threatened to shut down work on many large undertakings, rather than meet the demands for increased wages.

A recent report states that three residences of Queen's Park are being acquired by the Ontario Government as a site for an administration building to cost in the neighborhood of $1,250,000. The structure is required by reason of the present congestion in the Parliament Buildings, and the intention is to house in it such departments as at present have quarters in leased premises. The properties are being secured from the University of Toronto, the present owner. Building operations are to commence as soon as arrangements can be made.

Eight hundred men are at present employed on the Long Lac-Nakima cut-off for the Canadian National Railways. Present work consists of laying out the right-of-way. Steel will be laid in the fall.

Plans for a new bridge across the Speed River, at King St., Preston, Ont., have been submitted to the town council by the C.P.R. for approval The plans call for a reinforced concrete structure, 20 ft. long, with a width of 54 ft. and a 6 ft. sidewalk on both sides for pedestrians. It is thought likely that the town will call debentures for financing the construction, which will likely be commenced this summer.

An association known as the Dawson Good Roads Association, has been organized at Dawson City, Yukon Territory, with Mr. George Brimston as president and an executive composed of several of the district's best known citizens. The new organization's aim this summer will be to secure a new overland road giving direct connection between Whitehouse, Mayo and Dawson.

The Queen Victoria Park Commissioners, Niagara Falls, Ont., have planned an extensive program of improvements to be made this summer from Chippawa to Queenston. A large lavatory, with two tool sheds adjoining, will be erected at Queenston Heights. A station-type waiting room and restaurant, and probably a gasoline filling station, will be built at Niagara Glen, and at Dufferin Island a bathing house will be built. The latter will be equipped with lockers, showers and other modern bathing beach facilities. In addition to the above, considerable improvements to the Commission's roads are planned.

Obituary

Mr. Thomas A. Arthur, contractor, of Toronto, died at his residence in that city recently at the age of 62 years. Deceased was born at Shanty Bay, near Barrie, Ont., and his early contracting experience was confined to railroad work in Canada and the United States. Of late years he was engaged in house construction in Toronto.

CONSTRUCTIONAL ACTIVITY

Period of May 23 to May 29, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Beachville, Ont.
West Oxford township council contemplates a drainage system and specifications and estimates will be secured. F. J. Curry, Beachville, clerk.

Burlington, Ont.
Burlington town council will call for tenders for sewers on Torrance and Hamilton-Nelson Rd., on June 6.

Chilliwack, B. C.
The Provincial Government will repair and reconstruct roads in this district at cost of $25,000. This work includes building embankments and cribing to replace a section of the road washed out, the construction of a bridge at higher level and building two wing dams. W. H. Sutherland, Minister of Public Works.

Crystal Beach, Ont.
Sidewalks may be laid on various streets this summer by the Town. Frank Milligan, clerk.

Curran, Ont.
Concrete sidewalks are contemplated by the council. A Garran, clerk.

Fairground, Ont.
Estimates as to the cost of constructing the Wilson Creek drain, consisting of tile and open work, will be secured by the township council. W. V. Stevenson, Fairground, clerk.

Goderich, Ont.
Sewers n Cayley St., are contemplated by the town council. Councillor MacEwan, chairman of the water commission.

Hamilton, Ont.
The city contemplates Young St. from James to Wellington St. S. H. Kent, clerk.

The paving of Stinson St. from Wellington St., to Wentworth St., is contemplated by the City. S. H. Kent, clerk.

Hartney, Man.
The Municipality of Cameron will receive tenders for grading and draining 3.2 miles of roadways. T.B. Woodhull, secretary.

Mimico, Ont.
Tenders for sewers and water connections are being received by the town council until June 5. Plans and specifications may be seen at clerk C. J. Telfer's office.

Moncton, N. B.
The City council may extend the water and sewerage systems to the extension of St. George St., known as Pacific Ave. S. B. Anderson, clerk; J. Edington, engineer.

Tenders will be called by the city for extensions to the waterworks system on Defurgey Ave., from Union St. The cost of this work will probably be between $20,000 and $30,000.

Montreal, Que
The city council has voted funds for sewers as follows: Gday Ave., $9,933; Bilodeau St., $2,227; Dublin St., $2,226; Cote de Neiges Rd., $1,925. Rene Bauset, clerk.

The city has called for tenders for sewers on Grey Ave., Cote St. Antoine Road. to the City limits.

The city contemplates sidewalks on the following streets: Rosemount Blvd., $7,785; Giulford St., $1,000; St. Antoine St., $1,000. Funds for this work have been voted.

Nanaimo, B.C.
Tenders will be called soon for sewers costing $5,000 by the city The city engineer is preparing specifications. H. Busby, mayor.

Quebec, Que.
Tenders for resurfacing macadamized roads, addressed to the Department of Roads, will be received until June 12, as follows: Beauharnois County—in the municipalities of St. Stanislas de Kostka, Chateauguay, town, St. Joachim, P., Ste. Ormstown, V.—Huntingdon County.—Martine, P., Tres St. Sacrement p., Godmanchester, t.—Laval County—Ste. Dorothee, St. Francois de Sales, Ste. Vincent de Paul,—Vandreuil County—Belle Plage, v., Ste. Madalaine de Rigaud, Rigaud, town.

Tenders for the construction in gravelling of the following roads will be received by the Minister of Highways, Quebec, until June 15, as follows: Montreal-Ottawa, via Hull highway, in the following municipalities: Township of Chatham, 55,694 feet; village of Calumet, 2,580 feet; parish of Notre-Dame-de-Bonsecours, 18,539 feet; village of Templeton, 7,674 feet; township of Templeton. west part, 16,545 feet; Levis-Sherbrooke highway, in the township of Shipton, 21,689 feet; Victoriaville-Woburn highway, in the parish of St. Christophe, 21, 661 feet and in the township of Chester west, 37,168 feet.

Regina, Sask.
The provincial government invites tenders on the following roadwork until June 13: Kronau, west 5 miles; Southfolk to Eastend; Abby to Lancaster.

St. Mary's, Ont.
Council proposes to have drains constructed from the stock yards to the river. T. Clark, clerk.

Town council will extend the 4 in. watermains on Church St. and install fire hydrants.

Stellarton, N. S.
Tenders for 24,000 lineal feet of concrete pavement will be received by J. W. Henderson, clerk, until June 9

Trail, B. C.
The Town council contemplates sidewalks costing $3,500. Work will be done by day labor under the supervision of the City engineer.

Toronto, Ont.
The City of Toronto will receive tenders for the following roads, curbs and sidewalks, until June 5: Asphalt concrete and brick block pavement, Burgess Ave.; asphaltic concrete pavement, Brookside Dr., Pine Cres. and Williamson Road; asphalt pavement, Berkshire, Larchmount, Marigold, Rushbrook, Herrick and Main Sts.; Asphalt surface, Fraser Ave.; bituminous pavement, Bastedo, Corley, Burgess, Golfview, Heyworth Sts.; brick block pavement. Williamson Road; concrete curbng, Bastedo and Burgess Aves,; concrete pavement. lanes, 1st north of College, west from Grace St., 1st west of Grace from 1st lane north of College St.; concrete sidewalks, Annette, Fir, Hendrick, Ladysmith, Marigold, Pinewood, Rosemount, Rowantree, Selkirk, Silverthorne, Thorncliffe, Walpole, Westlake and Willard Aves. and Indian Grove, North Place. Pine Crest Rd. and Rose Park Cres.; granite block surfact, Scott St.

The city will receive tenders until June 5 for sewers on the following streets: St. Germaine, Starrett, Garfield, Brookdale and Spring Sts.

Vancouver, B.C.
The City of Vancouver is having specifications for a macadam highway by City Engineer Fellows.

CONTRACTS AWARDED

Fort William, Ont.
Salo & Co., 819 Alberta St., Fort William, have the contract for sewers for the city costing $10,000.

Hanover, Ont.
Canadian Des Moines Steel Co., Inshes Ave., Chatham, have the general contract for the waterworks, costing $135,000. The contract for turbines has been let to Wm. Kennedy & Sons, Owen Sound.

Moncton, N. B.
Daniel Goto, c/o the City engineer, has been awarded the contract for 20 catch basins at $50.97 each.

Murrayville, B. C.
R. McLaren & Co., Murrayville, has the general contract for ditching and excavating, for a drainage canal, at $9,500

Ottawa, Ont.
Ottawa Suburban Roads Commission has awarded the contract for an asphalt pavement on Metcalfe Road, near Ottawa, to the Standard Paving Co., Central Chambers, and also the contract for asphalt paving on Bowiesville Road

Owen Sound, Ont.
[illegible]

[illegible] the contract for oiling the provincial highway between Owen Sound [illegible] area and Thornbury, to Law & Co., Toronto.

Port Hope, Ont.
[illegible] [illegible] St., has a contract for sewers for the town amounting to $13,,713. Work will commence [illegible] June [illegible]

Quebec, Que.
Contract was signed on May 22 between the Minister of Highways, Province of Quebec, and F. W. Dakin, contractor, Sherbrooke, for the construction of a section of the La Prairie-La-Colle route at a cost of $294,297.90.

Regina, Sask.
The contract for a drain at Sliding Hills, has been awarded by the Provincial Government to Forshner Bros., Prince Albert, at $10,028.64.

Topham & Traub, Togo, have been awarded the contract by the Provincial Highway's Department for a drain at Kamsask, costing $3,424.50.

The contract has been awarded to Philippe Bernier, East Angus, Quebec, by the Minister of Highways of the Province, for repairs to the following roads: Richmond-Yamaska route, three sections to cost, respectively, $1,791.54; $11,822.66; $17,274.20. Another contract also goes to Mr. Bernier for repairs to gravel roads on the Drummondville-Annaville route. Three different sections call for, respectively an expenditure of $12,308.95; $3,991,86 and $6,861.23.

The provincial government has awarded the following road contracts; Glen Ewen west, 14½ miles, $16,433, O. Hanson, Estevan; Fairlight to Wawota, $15,380, W. H. Oliver, Oak Lake, Man.; Waseca to Lashburn, $7,360, Hett & Sibblad, St. Gregor to Munster, $8,648. Hett & Sibblad, Prince Albert.

Sarnia, Ont.
H. Walton, Jr., 118 Cobden St., has been awarded a contract for sidewalks and pavements by the City.

Toronto, Ont.
Kilmer & Barber, 10 Adelaide St. W., have been awarded contract for two sections of roadways by the city at $84,199. Commissioner of Works will pave one section at a cost of $88,850.

Contracts have been awarded by the City of Toronto, for the following sewers: Ruscica Bros., 256 Ontario St., $2,261; Commissioner of Works, $1,770; J. H. McKnight Construction Co., St. David St., $2,734; Grant Construction Co., Front St. east, $10,400.

The Department of Public Highways of Ontario has awarded Albion Paving Co., 69 Melrose Ave., Hamilton the contract for a Tarvia pavement in Stamford Township.

Victoria, B. C.
The contract for two miles of pavement at Chilliwack has been awarded by the Provincial Government to the Columbia Bitulithic Co., Vancouver, at $50,000. Rawlings and Labrash, have been awarded the contract for constructing 4.24 miles of the Vernon-Edgeworth road at $58,000.

Winnipeg, Man.
Sewers will be laid by the City engineer's Department costing $11,237.35. C. Elsasser & Sons have the contract for sewers costing $353.

Railroads, Bridges and Wharves

Clarksburg, Ont.
Bruce Hamilton, Clerk of Collingwood Township, will receive tenders for a steel or concrete bridge, 85 ft. x 16 ft., until June 7.

Elora, Ont.
Geo. Cromar, Clerk of Pilkington Township, will receive tenders for the construction of Moors's through concrete girded bridge, 26ft. x 18 ft., about one mile from Alma also Bye's bridge, 12 ft. x 18 ft. about four miles from Elora, until June 8. A. W. Connor & Co., 34 Victoria St., Toronto, engineers.

Kenilworth, Ont.
Sealed tenders for a Concrete Arch Truss Bridge 60 ft. x 18 ft., will be received by A. Hillyer, clerk, Arthur township, until June 11.

Montreal, Que.
C.P.R.contemplate building new Sattion (up-to-date) at Fredericton, N. B.

Niagara Falls, Ont
Queen Victoria Park Commission is having plans prepared for two stone bridges, one span, concrete top and sidewalks, iron railings. J. H. Jackson, superintendent.

North Bay, Ont.
Tenders for the erection of an extension to the offices of the T. & N. O. railway at North Bay, will be received by W. H. Maund, secretary, North Bay, until June 12.

Prairie Siding, Ont.
Tenders for a steel and concrete swing span bridge, 380 ft. long will be called shortly. W. G. McGeorge, 153 Queen St., Chatham, engineer. This brdge will be built for Kent county council.

Preston, Ont.
Plans have been prepared for the town council and Grand River Railway for a concrete bridge two hundred feet long across the Speed river. This bridge, which will have eight spans, will be fifty-four feet wide and will have sidewalks six feet wide. The forty-two foot roadway will accommodate the G. R. R. track. N. O. Hipel, mayor; Matt Kirkwood, railway manager.

Sarnia, Ont.
J. A. Huey, County Clerk, Sarnia, will receive tenders for the following bridges in Lambton County, until June 6: 1. Clay Creek bridge, 50 ft., St. Clair River Road, Sombra township; 2. Webster bridge, 26 ft. 6 in., at Long's creek in Dawn township; 3. Bradley bridge, over Munroe drain, Brooke township; Ferbie bridge, between concessions 12-13, Sombra township. Tenders must include furnishing all materials.

Three Rivers, Que.
Shawinigan Engineering Co., Shawinigan Falls, will make an extension to the street railway owned by the Three Rivers Traction Co. Ltd., at a cost of $75,000. This extension will be about five miles long.

Windsor, Ont.
Press reports state that the Detroit-Windsor bridge may be commenced this year.

Winnipeg, Man.
Tenders for the construction of a reinforced concrete culvert and bridge fill will be received by the C. N. R. engineer's office, Winnipeg, until June 7.

Woodstock, N. B.
The New Brunswick Public Works Department are busy on emergency work caused by the excessive high water, which carried away several bridges and washed out roads. They are calling for tenders at once for a steel bridge, concrete floor, with creosoted block wearing surface, span 126 feet, width drive road 26 feet, two walks of 6 feet each, to replace bridge carried away by freshet at Woodstock, N. B.

CONTRACTS AWARDED

Chatham, Ont.
Contracts awarded by Kent county for concrete and steel bridges are: Geo. W. Cutter, Chatham, seven bridges, at $15,279; J. J. Bradley, R. R. 2, Tilbury, one bridge, at $1,495. The contract for another bridge will not be awarded at present.

Fredericton, N. B.
The Provincial Government has awarded Guilford Hammond, Burden, N. B., the contract for repairing culverts at Barony and Pokick.

Prince Rupert, B. C.
H. Shockley, Prince Rupert, has the contract for a bridge for the city costing $13,000.

Strathroy, Ont.
Middlesex County council has awarded the contracts for a steel and concrete bridge as follows: Steel—Standard Steel Construction Co, 55 Main St, east, Welland, $6,196; concrete—F. W. Nichol, Ekfrid, $5,300.

Westmount, Que.
D. G. Loomis & Son Ltd., St., Patrick St., have been awarded the general contract for a $12,000 subway for the C.P. R., Windsor Station, Montreal.

Public Buildings, Churches and Schools

Calgary, Alta.
W. H. Cawston, 616-26th St., has not yet secured the materials for a parish hall for St. Stephen's Church, costing $20,390.

Fredericton, N. B.
Tenders are being received by the provincial Department of Public Works for an agricultural hall and gymnasium. Frechett & Freeney, 44 Sydney St., St. John, architects.

Hamilton, Ont.
John Poag, secretary of the Board of Education, will receive tenders for steel and reinforced concrete for the new collegiate. Hutton & Souter, Bank of Hamilton Bldg., architects.

Kitchener, Ont.
St. John's Anglican Church will have plans and estimates prepared for a parish

hall costing $25,000. Rector, Rev. Mr. Langford.

Montreal, Que.

A. H. Lapierre, 30 St. James St., Montreal, and Stevens & Lee, 62 Charles St. east, Toronto, are receiving tenders for the completion of the "Service Building" for Norte Dame Hospital, until June 8.

The Reverend Sisters of the Congregation of Notre Dame contemplate the erection of an pedagogie institute on Sherbrooke St. West, at a cost of $800,000. The architect has not yet been appointed.

New Waterford, N. S.

Plans have been prepared by A. J. McCormack, Ross Block, Sydney, for a 34 ft. x 66 ft., addition to a school for the town, costing $10,000. M. J. McKinnon, New Waterford, secretary.

North Bay, Ont.

Sealed tenders for the work necessary for the complete construction of the roadbed and track laying, ballasting and fencing approximately twenty-five miles of a branch line from Swastika to Larder Lake will be received by the Nipissing Central Railway Co., North Bay, until June 12. These tenders will not include steel work for bridges

North Vancouver, B .C.

Sub-trades for the High school, costing $71,000, have not yet been let. Benzie & Bowe, architects, 618 Standard Bank Bldg., Vanvouver; Geo. Campbell, secretary of the School Board.

Paris, Ont.

J. P. Gregory, chairman of the building and grounds committee, will receive tenders for the Board of Education for the High school, containing six rooms, gymnasium and auditorium, steel and brick construction, until June 7. F. C. Bodley, architect, Temple Bldg., Brantford.

Saskatoon, Sask.

Plans are being prepared by the Saskatoon Public School Board for a school building costing $23,000. Concrete, brick and tile will be used in the construction of this building.

South Vancouver, B. C.

A two storey frame Community Hall is contemplated by the Victoria Road Improvement Association, 27th Ave. and Victoria Rd., Vancouver. Building will cost about $8,000.

Strathroy, Ont.

Tenders for a nurses' home are being received by Chester Woods, architect. 217½ Christina St. north, for the Hospital Board. This building will cost about $20,000.

Toronto, Ont.

C. H. Acton Bond, 4 Wellington St. east, Toronto, will receive tenders for the construction of a one storey lavatory at Queenston Heights Park, 25 ft. x 44 ft., and a two storey Railway station at Niagara Glen, 54 ft. x 40 ft.

Burden & Gouinlock & Carter, associated architects, 101 King St. west, will receive tenders for the construction of a four-room school for S. S. 10, Scarboro township.

CONTRACTS AWARDED

Eganville, Ont.

R. G. Runkle, Eganville, will rebuild the school for the board. J. A. Ewart, Jackson Bldg., Ottawa, perpared the plans for the structure which will be of brick veneer, containing eight rooms and costing $34,000.

Hull, Que.

A. Archambault, 67 Wellington St., Hull, has the contracts for plumbing and heating for "Ste. Marie" school.

Nanaimo, B. C.

Baynes & Horrie, 846 Howie St., Vancouver, have been awarded the general contract for the Masonic Temple, costing $25,000.

Sudbury, Ont.

The Public School Board has awarded Chechetto & Knight, McAndrew's Block, the contract for an addition to a school. P. J. O. Gorman, Stafford Bldg., clerk.

The Separate School Board has awarded Bernier & Lacasse the general contract for a school on Mackenzie St., costing $65,000. The building will be of brick and concrete, 72 ft. x 84 ft., containing eight rooms.

Three Rivers, Que.

A. Dube & Cie, Bellefeuille St., have been awarded the general contract by the school board for a school costing $25,000.

Toronto, Ont.

Sullivan & Fried, 81 Victoria St., Toronto, have been awarded the general contract for the Roncesvalles car-house by the Toronto Transportation Commission.

Contracts awarded by the Board of Education for Silverthorn school are as follows: Masonry, $52,080, Witchall & Son, 156 St. Helen's Ave.; steel, $9,232, Reid & Brown, 63 Esplanade east; carpentry, $23,189, Frank Armstrong, 89 Oak St.; roofing, W. A. Moffat Co., 86 Don Esplanade; ventilating, $5,314, A. Matthews Ltd., 254 Adelaide St. west.; plastering, $6,654, R. C. Dancy, 57 Kendal Ave.

The City of Toronto has awarded the following contracts for the reception hospital: Masonry, Haltby Bros. Ltd., Hepbounre St., $197,000; carpentry, Fred Wilson, Bank St., $50,465; electrical, Canada Electric Co., King St., plastering, E. J. Curry, York Bldg., $21,450; painting, J. Casey, Dalhousie St., $5,680; elevator, Turnbull Elevator Co., John St.; drains and plumbing, R. Jordon, Hazleton Ave.

Waterloo, Ont.

Contracts awarded on the Waterloo Luthern Seminary, costing $40,000, are as follows: General contract, Ellert Bros, Park Ave.; heating and ventilating, Knell & Co., 45 King St. west, Kitchener; plumbing, Conrad Bros., King St., waterloo; steel, Hamilton Bridge Works, Bay St. north, Hamilton.

Business Buildings and Industrial Plants

Barrie, Ont.

Hall & Duerr, Lumsden Bldg., Toronto, have prepared plans for a theatre, seating capacity 600, for R. E. Garrett. Work on this building, costing $20,000, will commence at once.

Charlottetown, P. E. I.

C. B. Chappel & Hunter, Des Brisay Bldg., will call for tenders for a building for the Guardian Publishing Co., costing $22,000.

Haileybury, Ont.

R. Abram has not yet secured the materials necessary for the building of a store costing $10,000.

A store costing $20,000 is also contemplated by A. Giachin, Cobalt.

N. S. Dabous, Cobalt, may build a store costing $20,000. Materials have not yet been purchased.

Hamilton, Ont.

B. H. Prack, Bay St., Toronto, is receiving tenders for an eight storey fireproof building, concrete and brick construction, for J. E. Lister, Spectator Building, Hamilton.

Hull, Que.

A factory building, 45 ft. x 100 ft., stone and brick, may be built on Montcalm St. by the Capital Heating Co. Brodeur & Pilon, architects, 6 Hotel de Ville, are preparing the plans. Dr. J. Routhier, St. Joseph Blvd., is interested in the company.

Kitchener, Ont.

Arch-Schneider Packing Co., J. M. Schneider, 145 Queen St., manager, is having plans prepared for an extension to the packing plant costing $100,000.

McMurray River, B. C.

W. P. Hinton, Prince George, B. C., is having plans prepared for an oil extracting plant costing $6,000. This is to be the first unit of a more extensive plant.

Midland, Ont.

A press report states that an addition will be built to the G. T. P. grain elevator, doubling its capacity and that to facilitate the handling of cargoes an addition will be made to the wharves.

St. Etienne des Gres, Que.

Moise Boisvert, St. Etienne des Gres, will build a theatre on La Gabelle St. No materials have been purchased yet for this project.

Sarnia, Ont.

It is stated in a despatch that the Hunt Milling Co., London, propose to erect an elevator of 1,5000,000 bushels capacity at Point Edward.

South Porcupine, Ont.

Davidson Gold Mines, Ltd., King Edward Hotel, Toronto, will make extensions and improvements to their mill costing $900,000. Work may commence shortly Tenders are being called for sinking a shaft 1,000 feet. J. C. Platt, secretary

Three Rivers, Ont.

C. E. Gelinas, 120 Bonaventure St. and H. L. Clifford, 45 Bonaventure St., are interested in a project to erect a country club costing $15,000.

Toronto, Ont.

B. Swartz, 336 Dundas St. West, has prepared plans for a factory, to be erected on Adelaide St. near Spadina Ave. Building occupying the site at present will be wrecked. The new structure will be 42 ft. x 140 ft., brick. Steam heating,

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders for School

Tenders will be received by the Separate School Board of Toronto for the erection of an 8 roomed school on Shaw St., Toronto.

Plans and specifications may be seen at the office of the architect, J. P. Hynes, 73 King St. West, Toronto, from May 21st to June 4th, 1923.

Tenders close at **5 P.M. June 4th, 1923**, at the office of the Board, 477 Jarvis St., Toronto.

The lowest or any tender not necessarily accepted.

(Signed) E. S. HENDERSON,
Business Agent for the Board.
May 15th, 1923 20-22

County of Bruce

Sealed tenders will be received by the undersigned up to 5 o'clock p.m. on

Monday the 18th day of June, 1923,

for the following works at the County Buildings, Walkerton, for the Bruce County Council.

1. The Erection of addition to County Council Building.
2. The erection of Central Heating building and trenches for pipes.
3. The Installation of Central Heating Plant.

Plans and specifications may be seen and Forms of Tender obtained at the office of the undersigned on and after the 25th May, 1923.

FRED B. JAMES,
Architect, Walkerton, Ont.
20-22

Tenders for Concrete Truss Bridge

Sealed tenders will be received by Albert Hillyer, Clerk of Arthur Township, Kenilworth, Ont., up to 2 P.M. on

Monday, June 11th,

for the construction of a 60′ x 18′ Concrete Arch Truss Bridge at lot 27, con. 4, Arthur.

Plans and specifications may be seen after June 4th at the office of the Clerk or the Engineers.

The lowest or any tenders will not necessarily be accepted.

A. W. CONNOR & CO.
22 34 Victoria St., Toronto.

Tenders for Steel or Concrete Bridge

Sealed tenders will be received by Bruce Hamilton, Clerk of Collingwood Township, Clarksburg, Ont., up to 1.00 P.M. on

Thursday, June 7th,

for the construction of a concrete abutment and steel superstructure with concrete floor or for a concrete arch truss superstructure for an 85′ span with 16′ roadway and one sidewalk for Black's Bridge at Clarksburg.

Plans and specifications may be seen at the office of the Clerk or of the Engineers.

The lowest or any tender will not necessarily be accepted.

A. W. CONNOR & CO.
22 34 Victoria St., Toronto.

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

TENDERS
For Concrete Bridges

Sealed tenders will be received by Geo. Cromar, Clerk of Pilkington Township, Elora, Ont., up to 2 P.M. on

Friday, June 8th,

for the construction of Moore's Through Concrete Girder Bridge 26′ x 18′ at lot 4 con. 1 about 1 mile from Alma.

Bye's Bridge 12′ x 18′ at lot 8 con. 1 about 4 miles from Elora Plans and specifications may be seen after June 1 at the office of the Clerk or of the Engineers.

The lowest or any tender not necessarily accepted.

A. W. CONNOR & CO.,
22 34 Victoria St., Toronto.

TENDERS
for Railway Construction

The Nipissing Central Railway Company

Sealed tenders for the works (other than steel work for bridges) necessary to the complete construction of the roadbed, ready for the ties and rails, and the tracklaying, ballasting and fencing, upon approximately twenty-five miles of a branch of the Nipissing Central Railway, extending from Swastika on the Temiskaming and Northern Ontario Railway, to a point at or near Larder Lake, will be received at the office of the Secretary Treasurer of the Company, North Bay, until twelve o'clock (noon) of the

12th day of June 1923,

On receipt of a request in writing, a copy of each of the following documents:

Instructions to Bidders,
Form of Tender,
Specifications,
Form of contract

will be furnished to intending bidders, at the office of the Chief Engineer of the Company, North Bay, where plans and profiles pertaining to the work, may also be seen.

The right is reserved to reject any or all bids.

S. B. CLEMENT,
Chief Engineer.
North Bay, Ont.,
May 23, 1923. 22-23

POSITION WANTED by first class draughtsman and estimator on sheet metal and cornice work. Practical and selling experience. Box 269, Contract Record, Toronto. 21-22

Temiskaming and Northern Ontario Railway Commission

Tenders Wanted

Sealed tenders addressed to W. H. Maund, Secretary-Treasurer, The Temiskaming and Northern Ontario Railway Commission, North Bay, Ontario, will be received until twelve o'clock noon of

Tuesday the twelfth day of June

for the erection of an extension to the office building at North Bay, Ontario.

Plans, specifications and form of tender may be obtained at the office of the Chief Engineer, North Bay.

An accepted cheque on a chartered bank of Canada equal to five per cent of the tendered price, must accompany each tender.

The lowest or any tender will not necessarily be accepted.

S. B. CLEMENT,
Chief Engineer,
North Bay, Ont.
May 23rd, 1923. 22-23

Tenders
For Concrete Bridges

Sealed tenders will be received up to three o'clock, standard time,

Monday, June 11th, 1923,

for the undermentioned works.

(a) A reinforced concrete culvert and spillway, near Brora.
(b) A 60 ft. suspended arch of reinforced concrete, near Wilcox.
(c) A 40 ft. reinforced concrete beam span, near Esterhazy.

The contracts will be let separately for the individual works.

Tenders on these works may be mailed under one cover, but tenders for each separate work must be accompanied by an accepted cheque or other, satisfactory deposit for the amount of $250.00. Deposits of unsuccessful tenderers will be returned when the contracts are awarded.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister, Department of Highways.

Plans, specifications, forms of tender and all information may be obtained on application to the undersigned.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways,
Government of Saskatchewan.
Regina, Saskatchewan,
May 21st, 1923. 22

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 13, Section M, subsection (b)" will be received by the undersigned until eleven a.m. standard time on

Wednesday, June 13th, 1923,

for the excavation of approximately 30,600 cubic yards of earth and other work required in the construction of Provincial highway from Southfork to Eastend.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:- W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.; B. S. Walters, Sec-Treasurer, Town of Eastend, Sask.

An accepted cheque for the sum of $300.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of 3 p.m. standard time, Wednesday, June 13th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways, Regina, Sask.
May 23rd, 1923. 22

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 33, Section E, subsection (a)" will be received by the undersigned until eleven a.m. standard time on

Wednesday, June 13th, 1923,

for the excavation of approximately 23,000 cubic yards of earth and other work required in the construction of Provincial highway from Kronau West 5 miles.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:- W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.;

An accepted cheque for the sum of $300.00 payable to the Deputy Minister of Highways, or a Gurantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of 3 p.m. standard time, Wednesday, June 13th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways, Regina, Sask.
May 23rd, 1923. 22

Tenders Wanted

Sealed tenders, marked "Tender," and addressed to the undersigned or to John A. Huey, County Clerk, Sarnia, will be received up till 12 o'clock noon of

Wednesday, June, 6th, 1923,

for the furnishing of all material, erection and completion of the following bridges, for the County of Lambton, according to Plans and Specifications prepared by George A. McCubbin, County Engineer.

No. 1—Clay Creek Bridge—Span 50 feet centre to centre of bearing, 20 ft. roadway, on the St. Clair River Road, about the centre of the 14th Concession of Sombra Township.

No. 2—Webster Bridge—Length 26 ft. 6 inches over all, with a 24 ft. roadway, over north branch of Longs Creek on 15-16 sideroad in the west half of the 8th Concession of the Township of Dawn.

No. 3—Bradley Bridge—Over the Munroe Drain on 3-4 sideroad in the 9th concession in the Township of Brooke.

No. 4—Ferbie Bridge—Over 25 sideroad outlet drain where the said drain crosses the road between Concessions 12 and 13 of the Township of Sombra, at lot 29.

Tenders may be for the abutments and floors of any one of the bridges; for the steel work, or for the entire work of any or all.

Plans and Specifications may be examined at the office of George A. McCubbin, County Engineer, Chatham; or John A. Huey, County Clerk, Sarnia; or John McCallum, County Road Superintendent, Alvinston, Ontario.

All tenders must be accompanied by a marked cheque for 5% of the amount of tender.

Lowest or any tender not necessarily accepted.

JOHN McCALLUM,
County Road Superintendent.

Dated at Alvinston this
21 day of May, 1923. 22

SEALED TENDERS

For Two Buildings

for the Queen Victoria Niagara Falls Park Commission addressed to the undersigned will be received until noon,

Monday, June 12th, 1923,

One storey Lavatory at Queenston Heights Park, 25 x 64 and two storey Railway Station Building at Niagara Glen 54 x 40; both buildings will have rubble stone walls.

Bulk tenders will be received for all trades, or bulk tenders for Masonry, Carpentry and Plastering and separate tenders for Painting, Tinsmithing, Plumbing and Electric Wiring.

All tenders must be accompanied by a Bid Bond or certified cheque for 5% of the amount of the tender.

Plans and specifications will be ready on Thursday May 31st, and can be seen at the office of the Park Commission, Niagara Falls, Ont., or at the office of the Architect.

The successful tenderers will be required to furnish a bond for the due observance and fulfilment of the terms and obligations of the contract.

The lowest or any tender will not necessarily be accepted.

C. H. ACTON BOND, ARCHITECT,
4 Wellington St. E., Toronto.
22

CONTRACTORS' EQUIPMENT

Low prices for quick sale, large variety of equipment including 7 x 10 hoisting engine, three practically new ¾-yard London Concrete Mixers $1500.00, tower equipment, lumber, etc., one ½-yard gasoline mixer $250.00.

THE Wm. F. SPARLING COMPANY,
54 University Ave.
22 Toronto.

DEPARTMENT OF ROADS

Tender—Resurfacing

Tenders made on forms supplied by the Department of Roads and placed under envelopes bearing the words: "Tender—resurfacing", followed by the name of the interested municipality, shall be received at the office of the Minister of Roads, in the city of Quebec, Government Building, up to one o'clock of the afternoon (Eastern Standard time) on **Tuesday the twelfth (12) of June, 1923**, for resurfacing macadamized roads in the following municipalities:

County	Municipality	Road	Length
BEAUHARNOIS	St. Stanislas de Kostka,	Montee du village,	3.93 m
		5 Range West road,	1.50 m.
		Montee Larocque	1.05 m.
CHATEAUGUAY	Chateauguay, town,	Station Road,	0.95 m.
		Commune Road,	0.66 m.
		South Bassin Road,	1.01 m.
	St. Joachim, p.	Chateauguay River Road South,	0.28 m.
		Chateauguay River Road North	0.36 m.
	Ste. Martine, p.	310 Street,	0.21 m.
		Montee de la Petite Cote	0.45 m.
	Tres St. Sacrement, p.	East English River,	3.00 m.
		Pont Flottant,	0.30 m.
		West English River,	0.82 m.
	Ormstown, v.	River Road,	0.02 m
HUNTINGDON	Godmanchester, t.	New Erin Road,	2.63 m.
		5th and 6th Ranges,	3.25 m.
LAVAL	Ste. Dorothee,	Montee Champagne,	0.55 m.
		St. Antoine Range,	0.60 m.
		Montee Paquette,	0.58 m.
		St. Antoine East Range.	1.45 m.
	St. Francois de Sales,	Main Road,	2.37 m.
	St. Vincent de Paul,	Auclair by-road,	1.05 m
		Lower Bord de l'Eau Road,	2.65 m.
VAUDREUIL	Belle Plage, v.	Belle Plage Road,	0.88 m
	Ste. Madeleine de Rigaud,	Anse Road,	2.25 m.
		Baie Road,	0.08 m
	Rigaud, town,	St. Jean Baptiste Street,	0.57 m.

J. L. BOULANGER,
Deputy Minister

QUEBEC, May 28th, 1923.

Tenders Wanted

[illegible] separate tenders will be received by the undersigned up to 6 p.m.

Wednesday, June 6th, 1923,

for all trades in connection with additions and alterations to school building at Cooksville, Ontario.

The lowest or any tender shall not necessarily be accepted.

Plans and specifications may be seen at the office of the architect A. F. Patton, 2 Gould St., Toronto. 22

Central Heating Plant

Toronto Free Hospital for Consumptives

Weston, Ontario

Sealed tenders will be received by E. L. Ruddy, Chairman of Building Committee, 317 Spadina Avenue, Toronto, until **12 o'clock noon,**

June 8th, 1923,

for Boiler House, Concrete Pipe Conduits, Chimney, Boilers, Piping, Auxiliary Equipment, Radiation and Domestic Hot Water Equipment.

Plans and specifications may be seen at the office of the Consulting Engineer, **Malvern F. Thomas, 229 College Street, Toronto.**

A deposit of ten ($10.00) Dollars will be required for plans loaned to contractors. 22

DEPARTMENT OF ROADS

TENDERS

Montreal-Ottawa via Hull, Levis Sherbrooke and Victoriaville-Woburn Highways.

Tenders made on forms supplied by the Department of Roads and placed under envelopes bearing the words: "Tender" followed by the name of the interested highway and of the municipality, shall be received at the office of the Minister of Roads, in the city of Quebec, Government Building, up to one o'clock of the afternoon (Eastern Standard time), on

Friday the fifteenth (15) of June, 1923,

for the construction in gravelling of the following roads: Montreal-Ottawa via Hull Highway, in the following municipalities: township of Chatham, 55,694 feet; village of Calumet, 2,850 feet; parish of Notre-Dame-de-Bonsecours, 18,-539 feet; township of Lochaber, 23,563 feet; village of Thurso, 5,385 feet; village of Templeton, 7674 feet and the township of Templeton, West Part, 16,545 feet; Levis-Sherbrooke Highway, in the municipality of the township of Shipton, 21,689 feet; Victoriaville-Woburn Highway, in the municipality of the parish of St-Christophe, 21,661 feet and the township of Chester West, 37,168 feet.

The Government of the Province of Quebec does not bind itself to accept any of the tenders.

J. L. BOULANGER,
Deputy Minister.

Quebec, May 23rd, 1923. 22

TOWNSHIP OF SCARBORO

Tenders for Equipment

Sealed tenders, marked, "Tenders for Equipment", will be received by the undersigned at his office, 1361 Kingston Road, Toronto, up till 12 o'clock noon,

Tuesday, June 5th, 1923,

for the supply of the following equipment.

(1) **1 Concrete Mixer.**
(2) **Gravel Crushing and Screening Equipment with Power.**

Bidders must furnish specifications of equipment to be supplied.

Forms for tenders and all information may be obtained at this office.

The lowest or any tender not necessarily accepted.

C. E. FRASER,
Township Engineer,
Scarboro, Ont.

22

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 32, Section D" will be received by the undersigned until eleven a.m. standard time on

Wednesday, June 13th, 1923,

for the excavation of approximately 34,000 cubic yards of earth and other work required in the construction of Provincial highway from Abbey to Lancer.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:- W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.; F. E. McDonald, Sec.-Treas. R.M. No. 229, Abbey, Sask.

An accepted cheque for the sum of $700.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of 3 p.m. standard time, Wednesday, June 13th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways, Regina, Sask.
May 23rd, 1923. 22

FOR SALE
At St. John, N. B.

3—Locomotive Type Boilers 72" diameter 23' 6" long, 1666 sq. ft. heating surface each. 140—3" diameter tubes. Built by Johnston Brothers, Terrysburg, Mich.

1—Scotch Marine Type Boiler 8' 0" diameter, 8' 6" long, 436 sq. ft. heating surface, 60—3½" outside diameter tubes. Built by Lobnitz, Renfrew, Scotland.

If interested write Box 229, Station B, Montreal.
22-23

TOWN ENGINEER

Applications will be received up to Monday noon 4th day of June, 1923, for the position of Town Engineer, for the Town of Port Hope. Applicants to state qualifications and salary expected.

J. W. SANDERS,
Town Clerk.

22

STEEL PILING

Bought and Sold

Universal Equipment Company
Niagara Falls. 11-T-f.

Steam Shovel for Sale

70 Ton BUCYRUS Steam Shovel second hand, in good working order, located Winnipeg. Reasonable Price. For full particulars wire or write,

POWELL EQUIPMENT COMPANY LTD.,
403 McArthur Building,
Winnipeg, Man.

21-22

FOR SALE

Fire Proof Vault Doors

We have for immediate delivery 50 vault doors clear opening 30" x 78" built special for 17" wall, instead of 20" wall which is our standard. We will dispose of all or part of these doors at a very reasonable price in order to sell them at once.

DOMINION SAFE & VAULT CO. LTD.,
Niagara Falls, Ont.

22-23

FOR SALE

All Steel Derrick Car

This is a Standard, Steel Centre, Girder Construction Flat Car
36 feet long—100,000 lbs. Capacity,
on which is Erected Marsh & Henthorne Double Drum, Double Cylinder Engine with Two Independent Niggerheads;

Separate Friction, Swinging Gear Direct Connected to Engine;
Vertical Steel Boiler—Wooden Cab

All Steel Counterweight Derrick with 32 foot Steel Boom; Lifting Capacity about 5 Tons at 20 ft. Radius.

Car is Self-Propelled by Chain Drive arranged for on Both Trucks.

Complete with Cable and Blocks—
Ready for Operation.

THE MARITIME BRIDGE CO. LTD.,
New Glasgow, N.S.

22

REINFORCED CONCRETE GENERAL SUPERINTENDENT wants position on Buildings, Bridges or Elevators, can produce best results. Box 276, Contract Record, 21-24

CONTRACTOR'S SUPERINTENDENT, just disengaged, requires position, life-long experience, well up in all classes construction, quantities and estimating, excellent references. Box 224, Contract Record, Toronto. 22

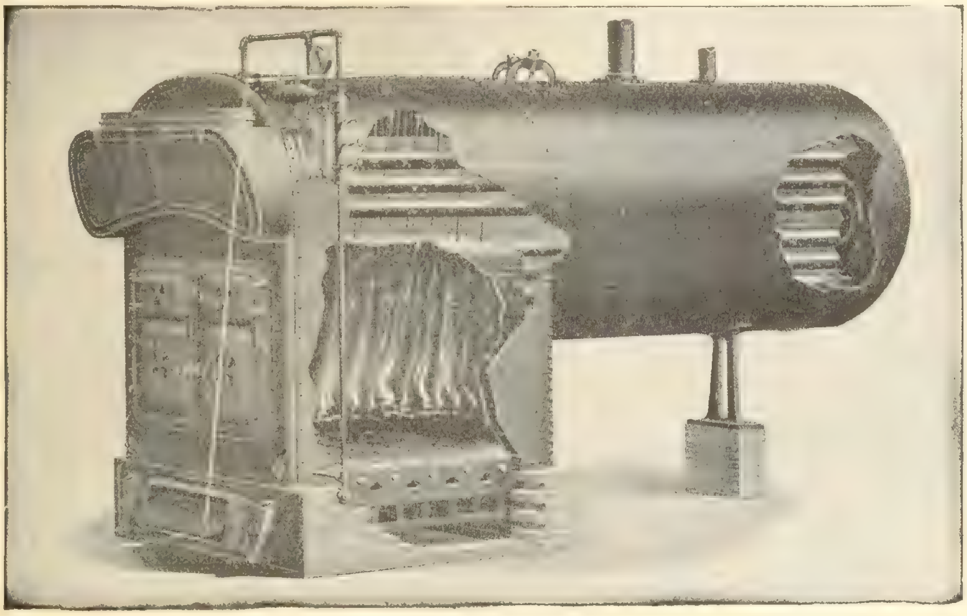
SUPERINTENDENT WANTED by General Contractor. Must be experienced in reinforced concrete and have first class references covering similar work. State age, experience, references and wages expected. Apply Box 279, Contract Record, Toronto. 22

THE JOHN INGLIS CO.

LIMITED

ENGINEERS AND BOILERMAKERS

ESTABLISHED 1860



BOILERS Of all types built to suit requirements.

TANKS, Stacks, Water Towers, and all classes of Steel Platework.

Engines and Pumps Marine, Corliss and Pumping Engines; Centrifugal Pumps, and all classes of Special Machinery.

First class workmanship—Best quality of materials—Prompt delivery
Write us for Prices, Catalogues, etc.

Office and Works—14 Strachan Avenue, TORONTO, Canada

Montreal Sales Office—385 Beaver Hall Square

metal sash, gravel roofing and hardwood flooring, are included in the specifications.

B. Swartz, 336 Dundas St. West, will receive tenders for a store and garage costing $12,000, until June 15.

Tenders for all trades for a store and apartments, costing $15,000 will be received by B. Swartz, 336 Dundas St. West, until June 15.

Vancouver, B. C.
R. T. Perry, 405 London Bldg., is preparing plans for a branch for the Bank of Toronto, to be built at Merritt, B. C. This building will be two storeys high, frame and stucco construction. Tenders will be called as soon as plans are complete.

CONTRACTS AWARDED

London, Ont.
A $100,000 warehouse, one storey, 70 ft. x 150 ft., brick, will be built by John Hayman & Sons, 432 Wellington St., for Reid Bros.

Montreal, Que.
John Sutherland, Cooper St., has the contracts for masonry and cut stone for the $150,000 office building being erected for the Spark's Estate. Erskine-Smith & Co., 21 Nicholas St., have the plumbing and heating contracts.

Port Hope, Ont.
B. Pennington & Son, Port Hope, have been awarded the contract for the smelter building of the Port Hope Sanitary Mfg. Co., at an estimated cost of $7,000.

Toronto, Ont.
Sullivan & Fried, 81 Victoria St. have been awarded the general contract for a garage for the City Dairy Co., Spadina Cres., costing $110,000. This garage, 4 storeys high, 80 ft. x 100 ft., will be built on the north side of Bancroft St. Gore, Nasmith & Storrie, Confederation Life Bldg., architects.

James A. Vance, Woodstock, has been awarded the general contract for a milk receiving station for the City Dairy Co., Toronto, to be built at Straffordville at a cost of $20,000. Gore, Nasmith & Storrie prepared the plans. Building will be of brick, 120 ft. x 40 ft., one storey high.

Residences

Haileybury, Ont.
N. Servais, Grimsby, contemplates building an hotel costing $25,000.

Hamilton, Ont.
A. Williamson, 469 King St. East, will build a $42,000 residence, two storeys high, brick and concrete block construction.

Chas. Salmon, 97 Ottawa St. South, plans to build three residences costing $25,000. Work on the first structure will proceed at once.

Mimico, Ont.
Mr. Loblaw, 367 Rushholme Rd., Toronto, is excavating for a $15,000 residence on the Lake Shore Rd. Sub-trades will be let.

Montreal, Que.
J. H. Brouillette, 530 Old Orchard Ave., has the foundations in for two dwellings costing $12,000 and will let roofing, electrical, plumbing, heating and plastering contracts.

A. S. Dawes, 143 Drummond St., will probably let the sub-trades for a dwelling costing $20,000.

C. H. Cote, 47 Blvd. Monk, has invited quotations on all materials necessary for the construction of a three storey brick building containing five flats, costing $16,000.

J. H. N. Hauteux, 762 Henri Julien St., has not yet secured the materials necessary for the construction of two brick residences, three storeys high, costing $30,000.

A. Gauthier, 355a Chambord St., is excavating for two residences to cost $30,000. No material has been purchased. Sub-trades will be let. These buildings will be three storeys high, 28 ft. x 80 ft.

N. Toupin, 2700 Lafontaine St., will let contracts for roofing, electrical work, plumbing, heating, plastering and painting, for a $12,000 residence.

A. Laquerre, 1647 Charbot St., will build six flats costing $15,000. Materials have not yet been secured. Several sub-trades will be let.

Mr. A. McCaughan, 390 Papineau St., will receive tenders for carpentry, electrical work, plumbing, heating and plastering, for six flats and garages costing $25,000.

Sandwich, Ont.
W. H. Furlong, Riverside Dr., contemplates building an apartment house in Windsor.

Three Rivers, Que.
J. A. Lambert will let masonry, roofing, electrical, plumbing, heating and plastering contracts for a residence costing $10,000.

H. McGrown, 17 Haut Bec., is excating for a residence of concrete and brick construction, costing $10,000.

Toronto, Ont.
W. Johns, 68 Belsize Dr., has the foundations in for a $10,000 residence on Adelaide Rd. Plastering, electrical, heating and plumbing concracts will be let.

A. B. Beverly, 127 Braemore Gdns., is building a $10,000 residence on Conrad Ave. Owner will let all trades and purchase lumber, roofing, plumbing, etc.

J. M. Jeffrey, architect, Confederation Life Bldg., is preparing plans for a $25,000 residence for Andred Dods.

Tenders for plumbing, heating, electrical work and plastering for a residence and garage costing $10,000 will be let by F. R. Fry, 2236 Bloor St.

Stewart R. Dewar, 335 Beresford Ave., has the foundations in for a residence costing $11,000 and will let several sub-trades.

Plans have been prepared for A. Edmunds, 35 Thome Cres., for a duplex house costing $20,000. Owner. will let sub-trades and buy all material.

Sub-trades for two duplex residences costing $25,000 will be let by B. F. Douglas, builder, 117 D'Arcy St.

W. E. Sharp, Jameson Ave., is excavating for a two storey dwelling on Lascalles Blvd. costing $16,000. Lt.-Col. O. Albrechtsen, 1 St. Clair Ave. East, architect.

B. Swartz, architect, 336 Dundas St. West, will receive tenders on all sub-trades for a $18,000 residence.

CONTRACTS AWARDED

Montreal, Que.
Miss G. Lewis, 17 St. John St., has awarded McRitchie & Black, 14a Sussex St, the general contract for two residences costing $25,000. Materials will be bought by the general contractors, who will also let the sub-trades.

Montreal West, Que.
O. Leger, c/o J. H. Lebeuf Ltd., 178 St James St, Ville St Pierre, has the general contract for three pairs of semi-detached residences, costing $13,000.

Point Grey, B. C.
J. K. Sinclair, 1662 Barclay St., Vancouver, will build a $12,000 residence for M. A. McDowell, Hamer St., Vancouver. Sub-trades are not yet let.

Toronto, Ont.
Walter Osborne, 144 Glengrove Ave. East, has been awarded the general contract for a $10,000 stucco and hollow tile residence for P. E. Emily, Bank of Hamilton Bldg.

Westmount, Que.
Dr. J. Chaquette, 1063 Delorimer St., has awarded H. Cote, 1921 St. Catherine St. the general contract for a $10,000 dwelling.

Power Plants Electricity and Telephones

Imperial, Sask.
The construction of three miles of telephone lines is proposed by the Imperial Rural Telephone Co., Imperial Sask. It is estimated that this work will cost about $1,000.

Kitchener, Ont.
Representatives from Kitchener and Waterloo city council, Board of Trade and the Manufacturers association have asked Sir Henry Thornton to have the Galt-Elmira branch of the C. N. R. electrified. Sir Henry stated that the request would be considered by C. N. R. officials.

St. Thomas, Ont.
Hydro power lines will be extended for a distance of five miles, east, west and south of the city, according to orders issued by the Hydro-electric Commission. It is expected that the service will be complete by the end of the summer.

Victoria, B. C.
An extension of the telephone lines along the Banff-Windermere Highway, from Invermere to Banff, is contemplated at a cost of $10,000.

CONTRACTS AWARDED

St. Etienne des Gres, Que.
Shawinigan Engineering Co., Shawinigan Falls, are constructing a power

BURLINGTON STEEL COMPANY, LIMITED

HAMILTON CANADA

Steel ingot which has been cut in half, showing the "pipe" in the centre and the porous segregated portion at the top. In the manufacture of rail steel the ingot is carefully cropped to remove all pipe and segregation, thus insuring a steel of the highest quality.

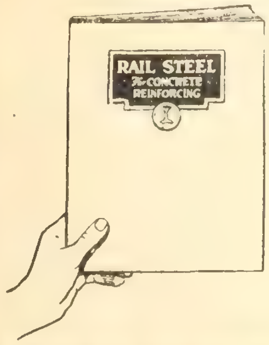
Quality and Metal Fatigue

The quality of steel is determined by the care used in its manufacture. Railroad rails, being subjected to enormous stress, both static and dynamic, are manufactured from steel made under the most careful methods. The tapping of the steel from the furnaces, the pouring of the ingots, the temperatures in the soaking pits, the rolling of the ingot to the bloom, the crop to eliminate the pipe and segregation, and the rolling of the rail, are all carefully followed by railway as well as mill inspectors. Particular attention is paid to the elimination of all piped and segregated material, so very important to the production of a pure and uniform product. It is from rails manufactured in this way that Rail Steel Reinforcing Bars are rolled. The bars retain all of the quality, all of the purity, and all of the strength of the original rail. Rail Steel Bars are made from a steel originally manufactured for a definite purpose, and this purpose demands the best steel possible to produce.

The impression sometimes gained is that the strain set up in the rails, due to their strenuous service on the railroads, is somehow or other carried into the bars produced from them and that the structure of the bar is thus impaired. This is not true. The heating of the rail for rolling removes every strain and the steel in the rail, as it enters the rolls of the bar mill, is in eactly the same condition as it was prior to its years of service.

RAIL STEEL BARS rolled from railroad rails have provided a concrete reinforcement of quality—quality obtained through care in manufacture—a degree of quality possessed by no other reinforcement steel.

Specify your reinforcing steel to meet A.S.T.M. specifications A-16-14.



Send for This Valuable Booklet—FREE

The first and only authoritative and comprehensive treatise on concrete Reinforcing Bars and containing most important information on the manufacture, qualities, and use of Rail Steel Bars.

[illegible] and dam for the St Maurice Power [illegible] Cap de Madeleine.

St. John, N. B.

The [illegible] Hydro Commission has awarded the general contract for a civic distribution system costing about $63,000, to the Stephens Construction Co., 124 Prince William St. City Engineer, G. G. Hare, City Hall.

Miscellaneous

Baddeck, N. S.

Atlantic Development Co. Ltd., Halifax, may open a plaster quarry here, this summer.

Brantford, Ont.

The City Council has authorized the construction of a concrete swimming pool, 150 ft. x 300 ft. A. K. Bunnell, clerk.

Fredericton, N. B.

The Provincial Government has announced that the Fredericton Housing Board will receive an additional grant of $30,000.

Hamilton, Ont.

Wentworth Quarries, Ltd., Hamilton, capital $200 000 will operate as quarry masters and stone merchants under a provincial charter.

Montreal, Que.

The Metropolitan Construction Co. Ltd., Montreal, has been granted a provincial charter and will operate as general contractors. The company is capitalized at $299,000.

Toronto, Ont.

Under an Ontario charter the Federal Construction Co. Ltd., Toronto, will carry on business as builders and general contractors.

Pioneer Builders, Ltd., Fort Frances, Ont., have been granted letters patent to carry on the business of builders and general contractors in Ontario with a capital of $40,000. Directors include, L. T. Truax, A. H. Watson, A. F. Scott and H. V. Zimmerman, all of Fort Frances.

Durham Stone and Sand Co. Ltd., has been incorporated with a capital of $500,000 and will operate from Toronto, Ont.

Burnt River Quarries, Ltd., Head offices, Toronto, capital, $100,000 has been granted a provincial charter to deal in stone and other building materials.

Welland, Ont.

Welland Contracting and Excavating Co., Welland, has been granted a provincial charter to operate as builders and contractors. The company is capitalized at $40,000.

Winnipeg, Man.

The Harris Construction Co., has been issued a provincial Charter and will operate as builders and contractors and dealers in building material.

CONTRACTS AWARDED

Calgary, Alta.

G. H. Bishop, 906—7th Ave., has the general contract for a concrete swimming pool for A. G. Baxter, 1025—6th Ave., Calgary. Steel lockers, separate filler plant, electric water pumps, steam heater, etc., will be required.

Charlottetown, P. E. I.

The City of Charlottetown, has awarded the contract for a 15-ton Road Roller to The Waterous Engine Works Co. Ltd., Brantford, Ont.

Toronto, Ont.

Power & McAllister, 20 Triller Ave., have been awarded the contract for the concrete retaining wall at the Roncesvalles car-house, by the Toronto Transportation Commission.

H. C. Lefroy Engineering Co., 11 Leader Lane, has the general contract for steel reinforcing bars for the addition to the Robert Simpson Co's. store. Bronze and ornamental iron work will be supplied by the Dominion Bronze & Iron Co. Ltd., H. A. J. Aldington, Yonge St. Arcade, agent.

Westmount, Que.

W. S. D. Cook, 10 Cathcart St., Montreal, has the contract for a signal tower for the C. P. R. costing $8,0000.

Fires

Oakville, Ont.

Damage estimated at $270,000 was caused by fire which destroyed the plants of the Oakville Basket Co. and the Dominion Wire-bound Box Co.

St. Agathe, Que.

Fire which swept the southern portion of the town destroyed an hundred and fifty buildings causing a loss of $400,000.

St. Faustin Station, Que.

Damage to the extent of $80,000 was the result of a fire which destroyed ten houses, a store and three ware houses.

TOWNSHIP OF SCARBORO

Tenders for Bridges

Sealed tenders, marked, "Tenders for Bridges", will be received by the undersigned at his office 1361 Kingston Road, Toronto, up till 12 o'clock noon,

Tuesday, June 5th, 1923,

for the construction of the following reinforced concrete bridges:

(1) **Bunker Hill, Road 2, Concession 2.**
(2) **Coatup Bridge, Road 24, Concession 2.**

Plans and specifications may be seen and forms for tenders obtained at the office of the engineer.

Marked cheque, or bid bond for 5% of the tender price must accompany each bid.

Separate tenders are required for each bridge.

Lowest or any tender not necessarily accepted.

C. E. FRASER,
Township Engineer,
Scarboro, Ont.

22

The Peace Tower

The Peace Tower, which rises over the main entrance of the Parliament Buildings is to be completed during the coming summer, and work is expected to be resumed on it shortly, following an amicable settlement of the "one-man" strike, when Chief Architect John Pearson left for Toronto taking with him, it is understood, the drawings for the completed tower.

The differences between Mr. Pearson and the Public Works Department over remuneration were stated by officials of the department to have been "amicably settled." Mr. Pearson will superintend the completion of the tower.

The design calls for a spire on the top of the tower. The second storey room

Electrify Mexican Road

The first railroad in Mexico to be electrified will be about 30 miles of the main line between Mexico City and Vera Cruz, where there are heavy grades.

We Issue Surety Bonds

for Contractors, for Public Highways, Contracts and all Municipal and private Corporation work.

We keep up to date information on contracts let and tenders called.

Try our service.
Phone Main 3476

Special Toronto Representatives

Fidelity Insurance Co. of Canada

FIDELITY AGENCY OF CANADA [illegible]

WE WILL BOND YOU

We can frequently be of assistance to you by insisting upon the deletion of irksome clauses often incorporated in agreements.

Resources over - - - $31,790,000
Canadian Securities - $ 2,247,500

HEAD OFFICE
36 Toronto Street
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General Manager for Canada

BRANCH OFFICES
Paris Building
WINNIPEG

Sidney W. Band
Assistant General Manager

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Canadian Secretary

UNITED STATES FIDELITY & GUARANTY
COMPANY

Let us prove to you just how you get more for your money when you buy a Modern Design Federal Truck for your construction work.

Another **FEDERAL**

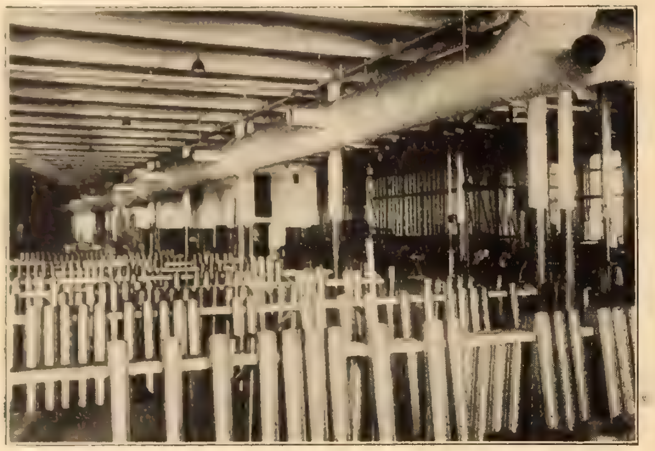
Means Another Satisfied Customer

Toronto, Ont. - - Jones Motor Company
291 King Street West

Montreal, Que. - - Lymburner Motors Inc.
3 Park Ave

Windsor, Ont. - - Thompson Auto
339 Pitt Street West

FEDERAL MOTOR TRUCK CO.
Detroit, Michigan



Where Experience Can Be Measured in Dollars and Cents

The experience of Sturtevant Engineers has a tangible value, because their recommendations mean an actual saving of dollars and cents in plants where Sturtevant heating and ventilating equipment is installed.

Folder 606 outlines specific savings. Ask for it today.

B. F. Sturtevant Company
of Canada, Limited.
Montreal - Galt - Toronto

Late News

Estevan, Sask.

A by-law may be placed before the ratepayers shortly authorizing the construction of a power plant. Town Engineer, J. H. Townsend, expects that the plant will be completed by October 1.

Hamilton, Ont.

The Suburban Area Commission, Court House, Hamilton, is having plans prepared for concrete bridges on Gage Ave. and Mount Albion Road. Mr. Vance, clerk.

Ottawa, Ont.

Tenders for dredging at Malgash, N. S., will be received by the Dominion Government, until June 8. R. C. Desrochers, secretary.

Plantagenet, Ont.

Tenders will be received until June 4 for the construction of a crushed gravel road south from Vankleek Hill towards Glengarry County. Tenders will also be received for the application of oil to various roads in Prescott and Russell Counties. F. A. Senecal, County Roads Superintendent. Patterson & Byrnes Co., 71 Sparks St., Ottawa, engineers.

Port Dalhousie, Ont.

Town council proposes to install sewers on several streets at a cost of $26,277. A. Wallace, clerk.

St. John's, Nlfd.

Armstrong-Whitworth Co., London, Eng., will establish a paper plant on the west coast of Newfoundland. The Newfoundland Government will guarantee principal and interest of $6,000,000. It is understood that this sum will be used for construction purposes. The plant will have a capacity of 400 tons a day.

Sault Ste. Marie, Ont.

Thielman Forest Products Lumber Co., 494 Queen St., will construct a branch line at Goulais Bay. The company will also extend its wharves. Jule Shielman, assistant manager.

Scarboro, Ont.

The contracts for sidewalks in the Danforth area and Birchcliffe Heights area were awerded to E. J. Elliott, 279 Main St., Toronto, and the contracts for sidewalks in the Kingston Road area, to W. B. Hughes, 83 Victoria Park Ave., Toronto. Prices for the Danforth and Birchcliffe contracts were, walk 19½ cents, excavation, 65 cents, fill 80 cents. For the Kingston Road contracts, prices were, walk, 17 cents, excavation, 70¾ and fill $1.25. Other bidders were: Grant Contracting Co., Toronto J. E. Coughley, Wallaceburg; A. Johnson, Toronto. C. E. Fraser, Township Engineer.

Toronto, Ont.

E. L. Ruddy, 317 Spadina Ave., chairman of the Building Committee, Toronto Free Hospital for Consumptives, Weston, will receive tenders for a central heating plant including: Boiler house, concrete pipe conduits, chimneys, boilers, piping, auxiliary equipment, radiation and domestic hot water equipment, until June 8.

The Toronto Hydro-electric Commission intend to make an extensive addition to the sub-station at Gerrard St., and Carlaw Ave. This addition will have a frontage of 124 ft. on Carlaw Ave. and 98 ft. on Gerrard St. It is estimated to cost $300,000 when completed.

Mount Royal Hotel
Montreal

Architects—Ross & MacDonald
Contractors—Thompson-Starrett Co. Ltd.

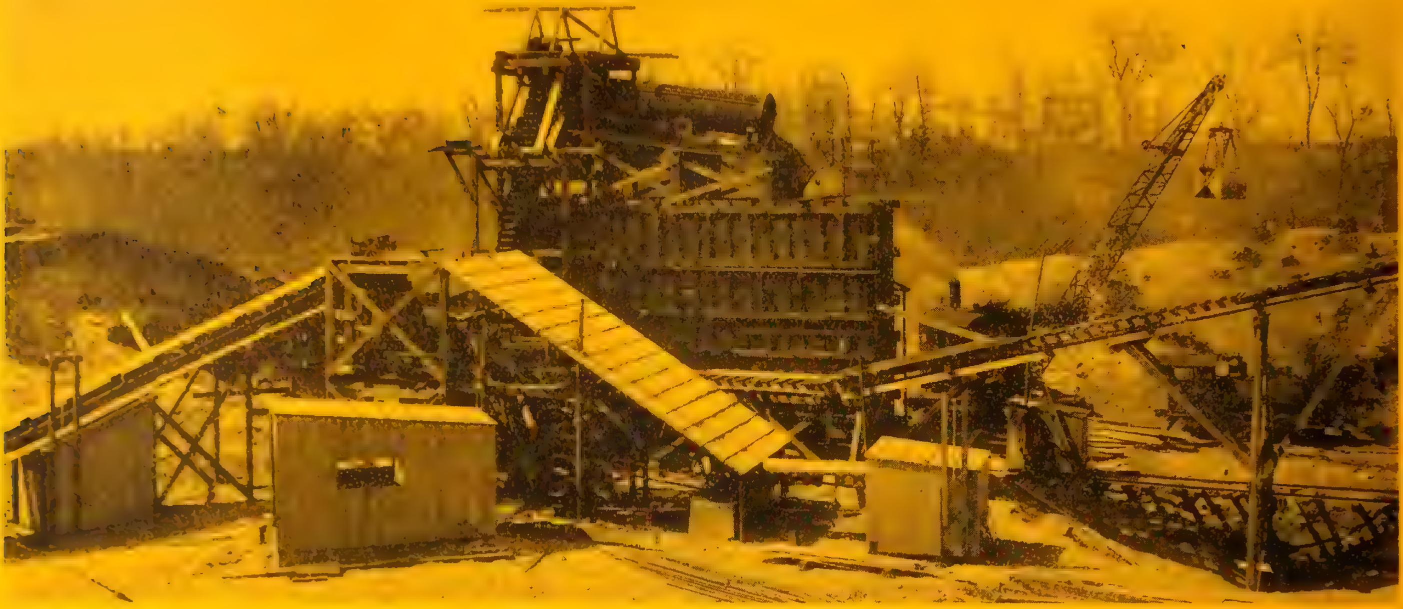
NATCO HOLLOW TILE

All the exterior walls of the Mount Royal Hotel are built of NATCO Hollow Tile, with a facing of brick. The column covering and principal interior partitions are also of NATCO Hollow Tile.

NATIONAL FIRE PROOFING COMPANY OF CANADA, LIMITED

Factory: Hamilton. Dominion Bank Building, TORONTO

NATCO Enclosure Wall Tile



New plant of the Brantford Sand & Gravel Co., capacity one hundred tons per hour. Designed and completely equipped by the Dominion Road Machinery Company, Limited. This plant can be operated to full capacity by three men

Champion for Dependability

Another Repeat Order From A Satisfied Customer.

The plant shown above includes one Number Five and one Number Six Champion Crusher, one 52-ft. twenty-four inch and one 30-ft. eighteen inch continuous Bucket Elevator. Screen equipment consists of one sixty inch by twenty-four foot Roller Driven Screen and one fifty-one inch by ten foot Roller Driven Screen.

All of this equipment is similar to dozens of other units which have been giving steady and satisfactory service throughout various plants in Canada for the past eight years.

Champion equipment is built to give the maximum of service with minimum upkeep and expense; not just to sell for a price. When we can find a better way to build it we will build it that way. When we can find a better guarantee we will give it.

Your inquiry will be appreciated and given our prompt and careful attention.

Champion Rock Crusher No. 4

Dominion Road Machinery Company
Limited
Goderich, Ont.

Sales Representatives:

General Supply Co.,
TORONTO

Rene Talbot
QUEBEC

Austen Bros. Ltd.,
HALIFAX

J. C. Berrie,
ST JOHN

J. H. McCarty & Co.,
MONTREAL

B.C. Equipment Co.,
VANCOUVER

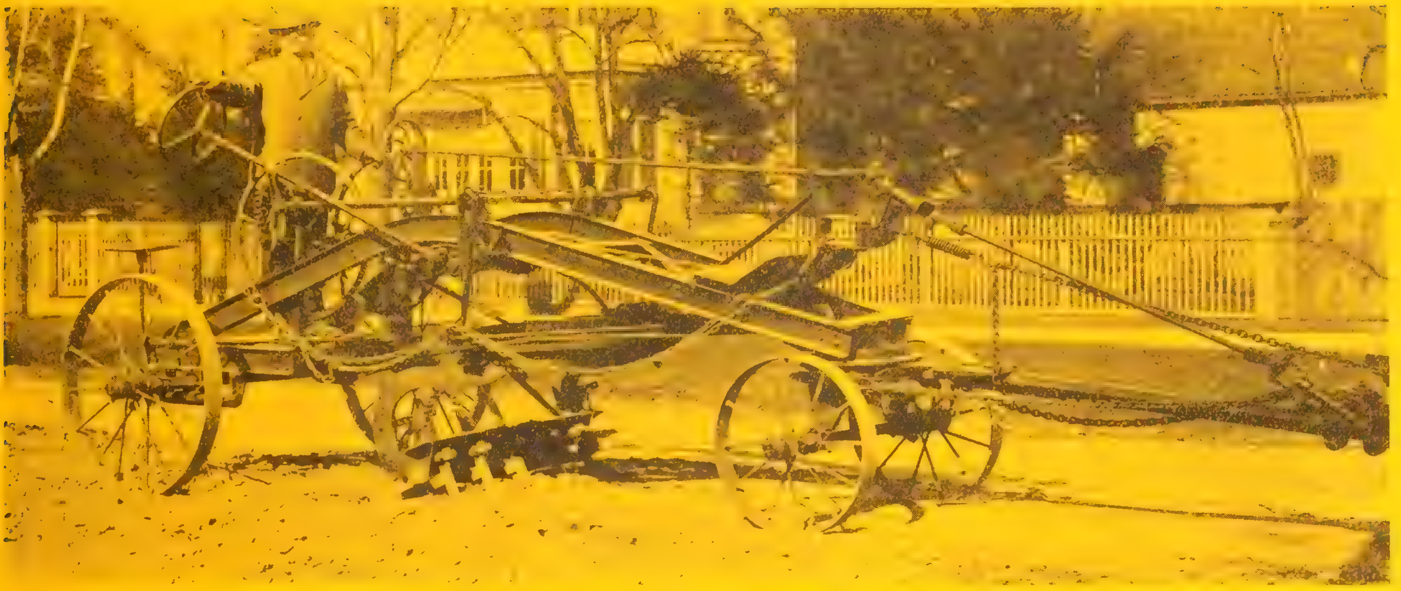
DOMINION Road Machinery

Established
1886

Graders
Scrapers
Crushers

Sweepers and Sprinklers
Sand and Gravel Plants
Pressure Distributors

Snow Plows
Coal Plants
Storage Bins



Champion Big Winner Grader with Scarifier ploughing up consolidated gravel street in Goderich, Ont. (Note heavy forged steel Scarifier Teeth).

Why Champion Graders are replacing others

Built like an Arched Bridge

An exclusive feature of the Champion Winner Graders is the steel Channel or I beam frame which runs in one smooth unbroken arch from front to rear axle; the strongest type of construction known.

Simplicity of Operation

All blade adjustments are of worm and gear type, giving a powerful, quick acting leverage, leaving the blade locked in the position desired.

The highest part of the frame comes directly above the blade giving the maximum blade lift and greatest range of angle adjustment for ditching.

Side Shift for Both Rear Axle and Blade

A rack and pinion permits the frame to be shifted from end to end of the rear axle. A simple and positive adjustment enables the operator to crowd his blade twenty inches directly sideways, avoid that soft spot at the edge of the road, and still reach out with the blade and clear the ditch fourteen inches below the wheels.

Scarifier Easily Substituted for Blade

The Champion Scarifier consists of a heavy steel casting carrying five reversible forged steel picks, one and three-quarter inches square by two feet long. This Scarifier can be substituted for the blade of our Big or Standard Winner machines right on the job in the course of 15 minutes' time, and will not only do the work of several pick plows on most jobs but frequently replace a steam roller with scarifier.

Unequalled for planing old gravel or stone road surfaces.

Information and quotations cheerfully furnished.

DOMINION ROAD MACHINERY COMPANY, LIMITED, Goderich, Ont.

Sales Representatives:

General Supply Co., TORONTO	Rene Talbot QUEBEC	Austen Bros. Ltd., HALIFAX	J. C. Berrie, ST JOHN	J. H. McCarty & Co. MONTREAL	B.C. Equipment Co., VANCOUVER

DOMINION Road Machinery

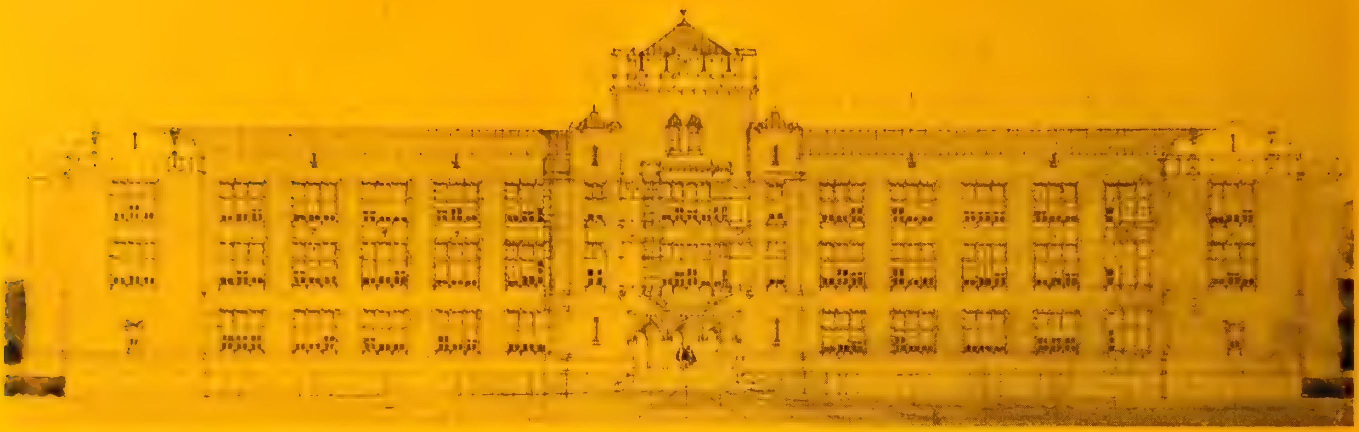
ESTABLISHED 1886

Graders
Scrapers

Rock Crushers
Sand and Gravel Plants

Pressure Distributors
Sweepers and Sprinklers

Coal Plants
Snow Plows



Jarvis Collegiate Institute, Toronto, Ont.

A Famous Collegiate Erects New Home

and George Oakley & Son, Limited supplies the stone

After many years of waiting, Jarvis Collegiate Institute, Toronto, is to have a new home—and one that will in every way be worthy of this well known and much-loved school.

The stone work which is to play such an important part in the building's appearance is in charge of George Oakley & Son, Ltd., and comprises

Variegated Indiana Lime Stone

Cut and fashioned at our own plant, and

"Made in Canada"

Complete facilities, long experience and an enviable record of work accomplished were the chief factors in the placing of this contract.

The same service is available to you. Let us make an estimate on your next job.

Geo. Oakley & Son

LIMITED

278 Booth Ave. - TORONTO

Dublin to be Modern

Despite all the turmoil and discouragement in Ireland at the present time, there are on foot two great and expensive projects for the improvement of the city of Dublin.

Elaborate plans for enormous changes have been prepared, which would make a new modern city out of the old. The promoters of the principal plan estimate its cost at £10,000,000, while its critics put the cost at over £30,000,000, and there is no visable source from which either sum could be raised.

One plan is to build a large central railway station near the ruined custom house and turn the custom house into a new postoffice. Since the destruction of the postoffice, in Easter week, 1916, Dublinhas had no central postoffice except inadequate makeshifts. Another element in the plan is the building of a new Parliament house on the site of the Royal hospital at Kilmainham.

The Free State senate is now housed in the art museum, and the Dail in the adjoining Leinster house taken over temporarily from the Royal Dublin society. A new parliament house will soon have to be built. The Kilmainham proposal has been criticized by those who think that the Irish parliament should be housed in the Bank of Ireland, once the scene of Grattan's parliament. But the Government does not consider the bank premises suitable, and even the sentimental association of the place is decried by some, who point out that the Free State is not the inheritor of the Grattan tradition, but of the tradition of Theobald Wolfe Tone for complete Irish independence.—Dublin correspondence.

Mountain Tunnels

A wonderful and most important feat of engineering was recently completed in New Zealand. This was the making of Arthur's Pass Tunnell, which runs right across the South Island from one coast to the other, and through a very mountainous region. It is 5 miles 545 yards long, thus having the distinction of now being the longest tunnell in the British Empire.

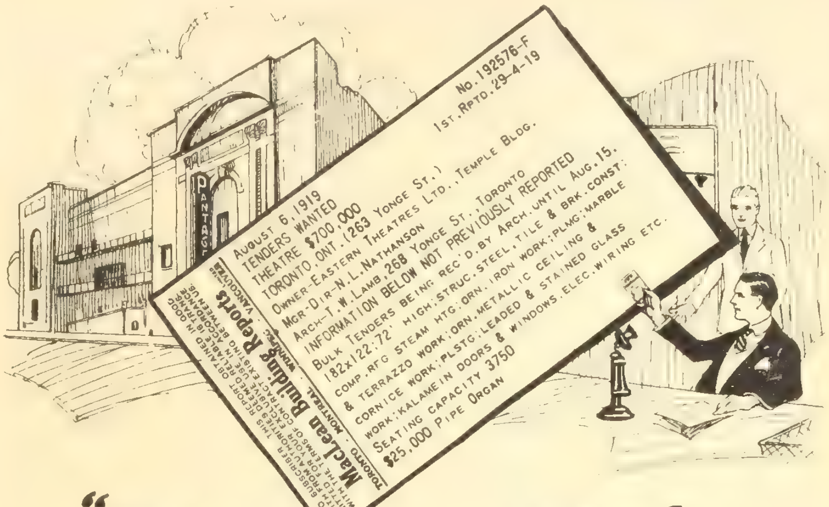
Throughout its entire length there is not a single curve, the whole five miles of single, electrically-operated track being perfectly straight.

This tunnell is going to make a great difference to the trade of the island. Previous to the opening, all goods had to be transported from one side to the other by sea, which is, naturally, more expensive, and takes much longer, than by rail.

The second longest tunnell in the Empire is in the British Isles, and until the beginning of the year it claimed to be the longest. This is the Severn Tunnell which connects Bristol with Wales, and is 4 miles 636 yards long. Probably a greater volume of coal and general merchandise passes through this tunnell than any other in the world.

Plan an Office Building

Erection of a new business and office building in the Hotel Cadilac- Michigan avenue district, Detroit, of from eight to fourteen storeys is forecast in the announcement that a 99-year lease has been taken of the property at 219, 221 and 223 Michigan avenue.


PANTAGES
TORONTO MONTREAL WINNIPEG VANCOUVER
MacLean Building Reports
No. 192576-F
1st. Rptd. 29-4-19
August 6, 1919
Tenders Wanted
Theatre $700,000
Toronto, Ont. (263 Yonge St.)
Owner-Eastern Theatres Ltd., Temple Bldg.
Mgr-Dir-N. L. Nathanson
Arch-T. W. Lamb, 268 Yonge St., Toronto
Information below not previously reported
Bulk tenders being rec'd. by Arch. until Aug. 15.
182x122:72' high; struc. steel, tile & brk. const:
comp. rfg steam htg: orn. iron work; plmg; marble
& terrazzo work; orn. metallic ceiling &
cornice work; plstg; leaded & stained glass
work; Kalamein doors & windows. elec. wiring etc.
Seating capacity 3750
$25,000 Pipe Organ

"It is impossible for contractors to do without them"

So writes the Jackson-Lewis Co. Ltd., who erected Pantages Theatre, Toronto. They also add, "We are using the reports almost exclusively for posting ourselves on contemplated work or work in progress."

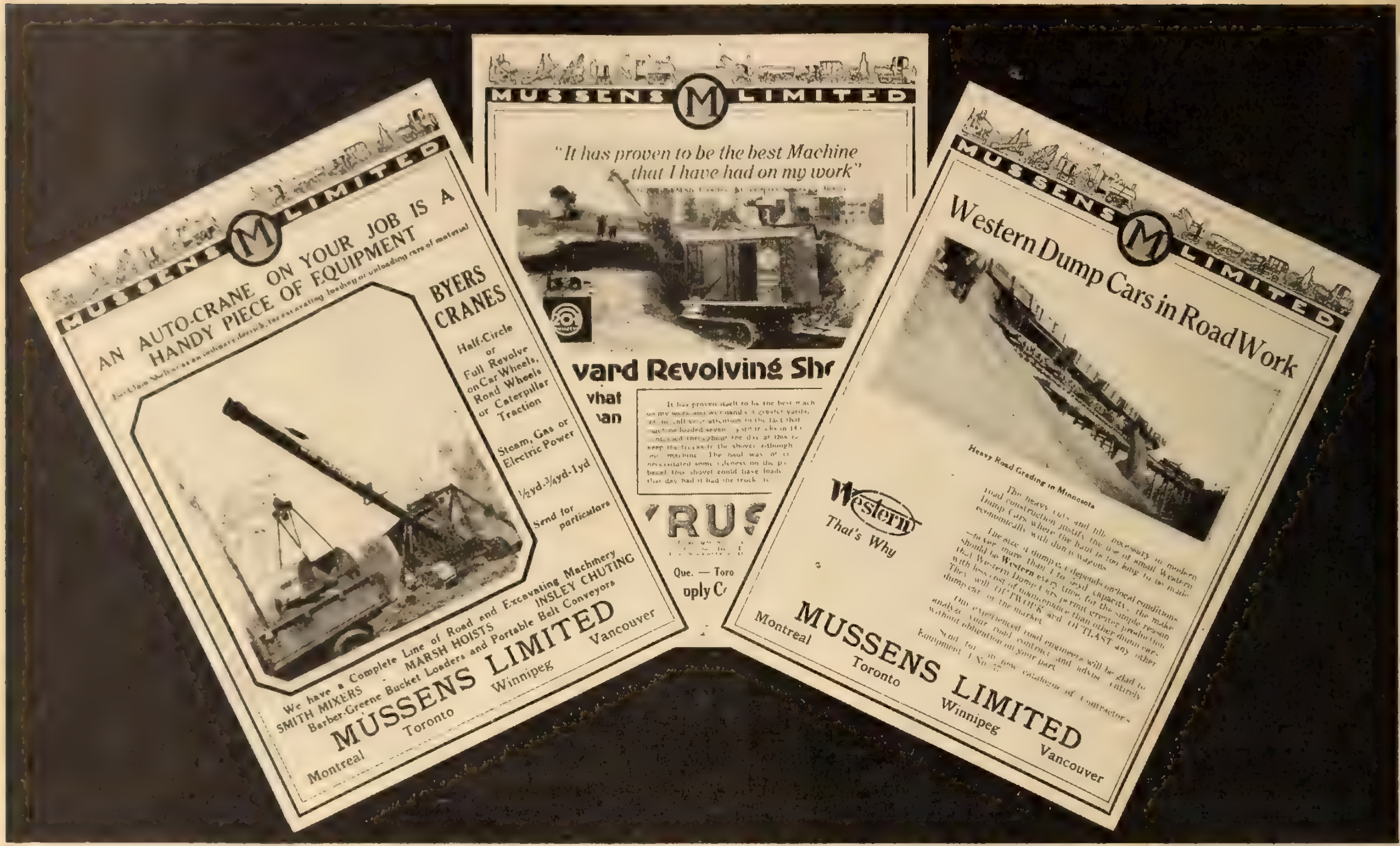
Every business day MacLean Building Reports are supplying authoritative, advance information to more than 1300 firms across Canada. From Halifax to Vancouver contractors, sub-contractors, manufacturers, dealers and agents find they are no longer chasing business bubbles or following blind trails. They are basing their sales efforts—both advertising and personal solicitation—on this information. They find that it pays in a big way.

Perhaps you can use MacLean Building Reports to advantage in your business. We shall gladly explain how. Write to-day for rates and sample reports.

Our new 16 page booklet. **"Getting Sales Facts First,"** tells how MacLean Building Reports are being used with profit by the country's leading concerns in many different lines. It is full of suggestion which will be valuable in your own affairs. Write for it on your letterhead—it is free.

MacLean Building Reports, Ltd.

345 Adelaide St. West, Toronto
119 Board of Trade Building, Montreal
325 Main St. Winnipeg



MUSSENS LIMITED

AN AUTO-CRANE ON YOUR JOB IS A HANDY PIECE OF EQUIPMENT

BYERS CRANES

Half-Circle or Full Revolve on Car Wheels, Road Wheels or Caterpillar Traction

Steam, Gas or Electric Power

½yd.-¾yd.-1yd

Send for particulars

We have a Complete Line of Road and Excavating Machinery
SMITH MIXERS - MARSH HOISTS - INSLEY CHUTING
Barber-Greene Bucket Loaders and Portable Belt Conveyors

MUSSENS LIMITED
Montreal Toronto Winnipeg Vancouver

MUSSENS LIMITED

"It has proven to be the best Machine that I have had on my work"

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MUSSENS LIMITED

Western Dump Cars in Road Work

Heavy Road Grading in Minnesota

Western
That's Why

MUSSENS LIMITED
Montreal Toronto Winnipeg Vancouver

What Do Mussens Limited Think of Contract Record?

Well we haven't asked them, and they haven't said in so many words.

But this is what they have **done.** They have recently signed a contract for three pages in color in every issue of this paper for a year.

That, perhaps, more eloquently than any testimonial they could write, expresses their opinion of the value of advertising in Canada's leading publication in the construction and engineering fields.

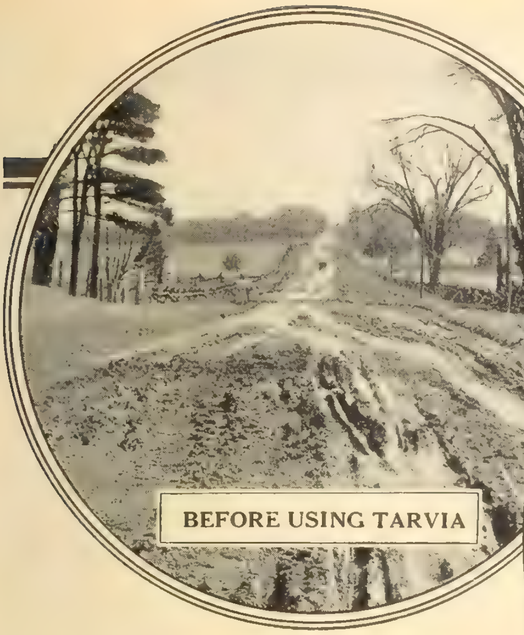
If Mussens were a young firm or a new advertiser this decision of theirs might not have so much significance. The fact is, however, that for many years a full page advertisement for this firm has been appearing in every issue of "CONTRACT RECORD", and this increase of 300 per cent in the volume of their advertising in this one paper has been made after the most exacting test of the value of the publication.

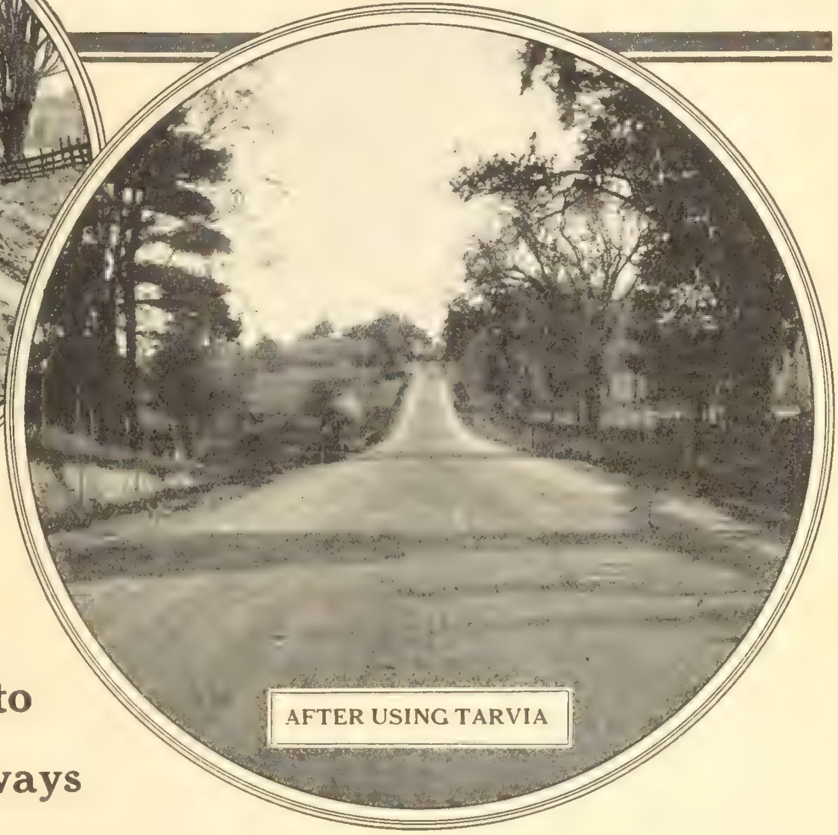
Experience has evidently taught them that the buyers of heavy equipment in Canada read and are influenced by the advertisements which appear in "CONTRACT RECORD".

We believe it is also evidence of another important fact. It indicates Mussens' conviction that the year 1923 gives promise of increased activity in construction projects. They evidently believe that this is going to be a "buying" year.

If this is true, will it not pay other distributors and other manufacturers to use impressive space in the advertising pages of "CONTRACT RECORD"?

You'd scarcely believe that this smooth, dustless, easy-traction road was ever in the wretched condition shown at the left. Yet the two views are of the same section of Yonge Street, near Holland Landing, Ontario, before and after Tarvia Construction.


BEFORE USING TARVIA


AFTER USING TARVIA

Tarvia transforms old-fashioned mud roads into mudless, dustless highways

Today we know that good roads are indispensable to the progress and happiness of every community. With good roads, getting to town is made a matter of minutes—not miles; business flourishes, hauling costs decrease, property values rise, children enjoy the benefits of a central school, community and social life is broadened and made more enjoyable.

Throughout the Dominion our engineers have demonstrated to scores of road officials the sound economy resulting from a definite policy of Tarvia construction and maintenance.

This popular road material is unequalled for building new roads, for resurfacing wornout macadam, for repairing and maintaining improved roads of every type. Special grades are made for special uses.

Tarvia roads are an indispensable part of every Good Roads Program. They are comparatively low in first cost, and are so much more economical over a term of years that the saving makes a more extensive road program possible.

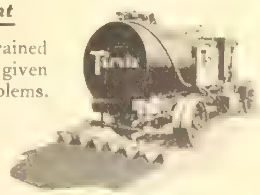
If you want smooth, dustless, mudless roads in your community 365 days in the year, write to our nearest office for free copy of our illustrated "General Tarvia Catalog." You'll find it interesting.

Tarvia

For Road Construction
Repair and Maintenance

Special Service Department

This company has a corps of trained engineers and chemists who have given years of study to modern road problems. The advice of these men may be had for the asking by any one interested. If you will write our nearest office regarding your road problems, the matter will be given prompt attention.



WINNIPEG VANCOUVER HALIFAX, N. S.

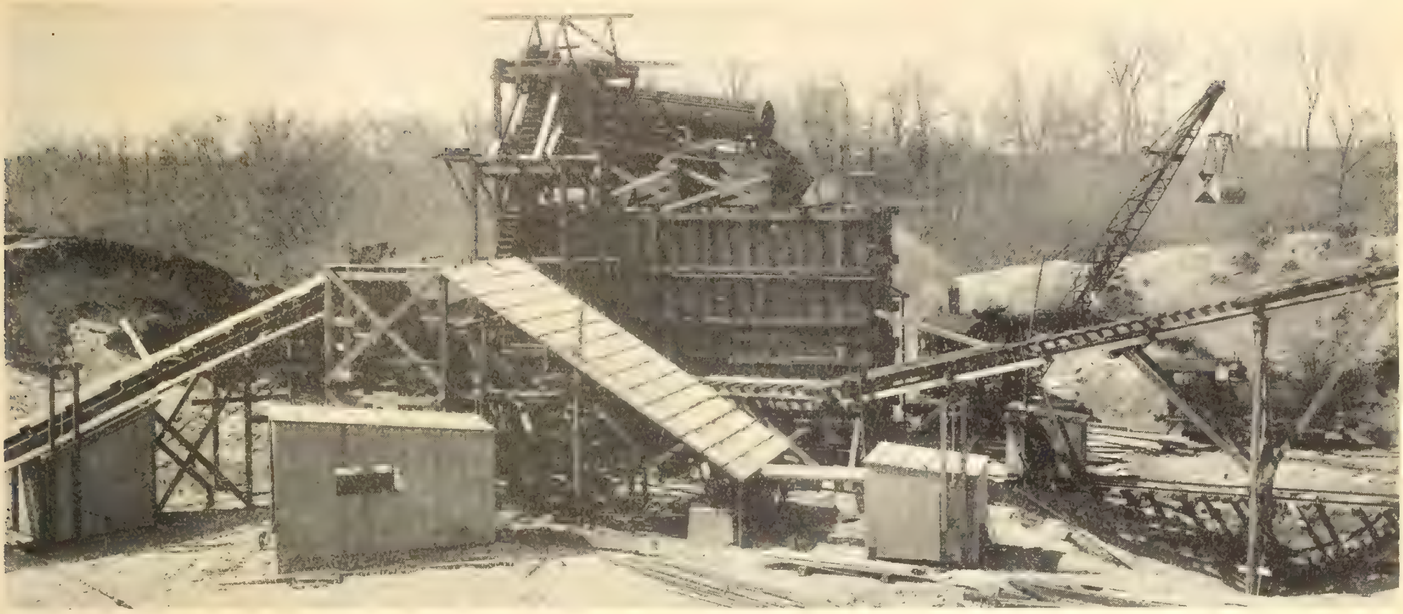
The Barrett Company
LIMITED

MONTREAL TORONTO ST. JOHN, N. B.

Current Prices of Building and Engineering Materials

		Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.45
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	10.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	25.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*‡	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	25 00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00**	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 “	“ “
Crusher run	per ton	2.20½		3.00 “	“ “
Rubble stone	per ton	2.45	1.70	15.00 cord	“ “
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	“ “
Gravel 1 in. screened	per ton	2.31	1.50	2.75 “	“ “
Sand, screened	per ton	1.42½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 “	“ “
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base	4.00 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 “	4.00 “	5.10 base	
Hoops	per 100 lbs.	5.00 “	3.75 “		
Twisted and deformed bars	per 100 lbs.	3.90 “	4.00 “	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	4.00 “	4.00 “	5.35	6.00
Structural shapes	per 100 lbs.	3.90 “	4.25 “	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 “	3.90 “	5.15	6.25
Plates—3/16 in.	per 100 lbs.	4.40 “	4.25 “	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.50 “	4.50 “	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.50 “	5.00 “	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 “	7.00 “	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 “	7.00 “	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 “	6.00 “	7.00 base	
Cast iron pipe	per ton	65.00 “	60.00 “		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.45	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. ‡Bag of 50 lbs. **Price f.o.b. cars is $11.80.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.



Recent addition to our plant showing new and up-to-date equipment which enables us to take care of greatly increased business

Sand and Screened Gravel

Capacity 30 Cars per Day

With a product passing the highest government tests, crushed and screened by modern methods, we have a wealth of material available in the following carefully graded sizes—asphalt, brick, plastering or concrete sand and crushed, graded and washed, gravel from pea up to 2½″.

Our customers may rest assured that all our material is not only acceptable but preferable for any class of bulk and structural concrete work.

Excellent transportation facilities enable us to ship via C.P.R., M.C.R., G.T.R. and T.H. & B.

Quotations and further information cheerfully given

Brantford Sand & Gravel Co. Ltd.

Brantford, Ontario

CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS—continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	94.50	65.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	45.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	130.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	145.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	42/48	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	50/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.50	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	70.00
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	15.00	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	14.50
Putty in bulk	per cwt.	5.95	4.25	5.50	6.50
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.43	1.40	1.26	1.56
Raw linseed oil, in bbls.	per gal.	1.40	1.38	1.23	1.53
Turpentine, in bbls.	per gal.	1.90	2.20	2.50	2.80
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	26.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.25	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers (Common)	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Laborers (Skilled)	per hr.	.60- 70			.90
Sheet Metal Workers	per hr.	.80			

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

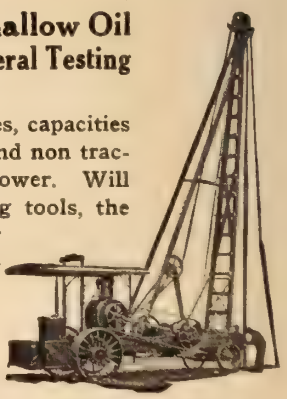
PLASTER *Including bags.

Cyclone Churn Drills

For Blast Hole, Water, Shallow Oil and Gas Well Drilling and Mineral Testing

The No. 14 Cyclone Blast Hole Drill is a machine especially designed and constructed for drilling blast holes in quarries, open pit mines and for heavy rock excavation. Built in two sizes in both traction and non traction types with gasoline, electric or steam power. Covered in our Catalog B-45.

Cyclone Well Drills are built in 5 sizes, capacities 200 to 2000 feet and in both traction and non traction types with gasoline or steam power. Will operate cable and hollow rod drilling tools, the latter by either the self-pumping or jetting process. Well Drills are described in our Catalog A-70.



The Sanderson-Cyclone Drill Co., Orrville, Ohio, U.S.A.

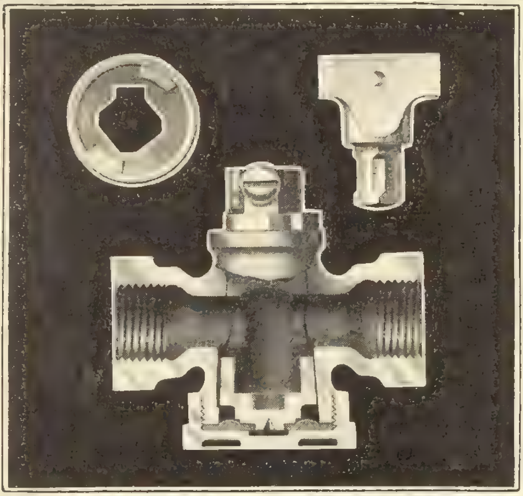
Mussens Ltd., Canadian Representatives — Montreal, Toronto, Winnipeg and Vancouver

Dividend Producers

Recognizing that continuous, uninterrupted service pays the biggest dividends, *MUELLER* designed a Curb Cock (A-650 below) that is practically trouble-proof.

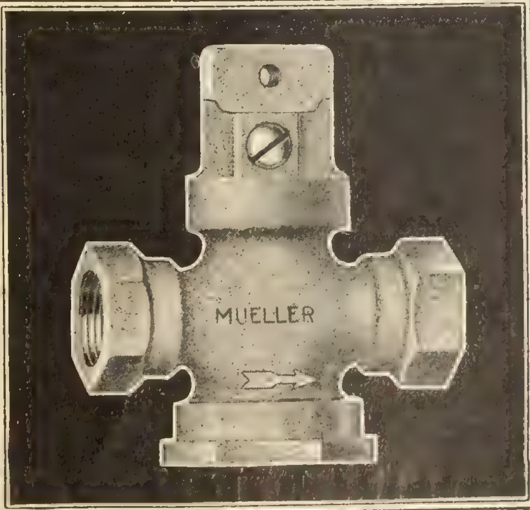
The key will not set or stick—cannot leak—and can be opened and closed easily, quickly, snugly.

No digging up of cocks that don't work, when you use these dividend producers.



MUELLER
Inverted Curb Cocks

Note how the key tapers toward the top—preventing wedging from weight of rod. The weight of the rod actually loosens the key—but it can't remain loose, for the water pressure beneath the key forces it up and holds it tight. The check is so sturdy and true that even under hard usage the cock is certain to be fully opened or fully closed. Tested to stand 200 pounds hydraulic pressure.



Details and prices
on request.

H. Mueller Mfg. Co., Ltd.
Sarnia, Ont.

Water, Plumbing and Gas
Brass Goods and Tools.

American Factory at Decatur, Ill.,
U. S. A.
Branches, New York and
San Francisco

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1—Stevenson Adamson 24″ x 36″ Centres.
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1—8″ x 10″ National Single Drum Non-reversing Drum 30 x 30.
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1—120′ Insley concrete tower with 1—24 cu. ft. bucket and 1—36 cu. ft. hopper.

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1—Model W Cleveland Engine.

Trenching Machine

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1—1 yard Owen.
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1—No. 8½ D Acme Crusher on truck with Elevator portable bin and portable steam engine.
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1—48″ Symons Disc.

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5—Plain Wooden trussed flat Cars length 25′.

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11—6 yard all metal "V" shaped cars standard gauge.
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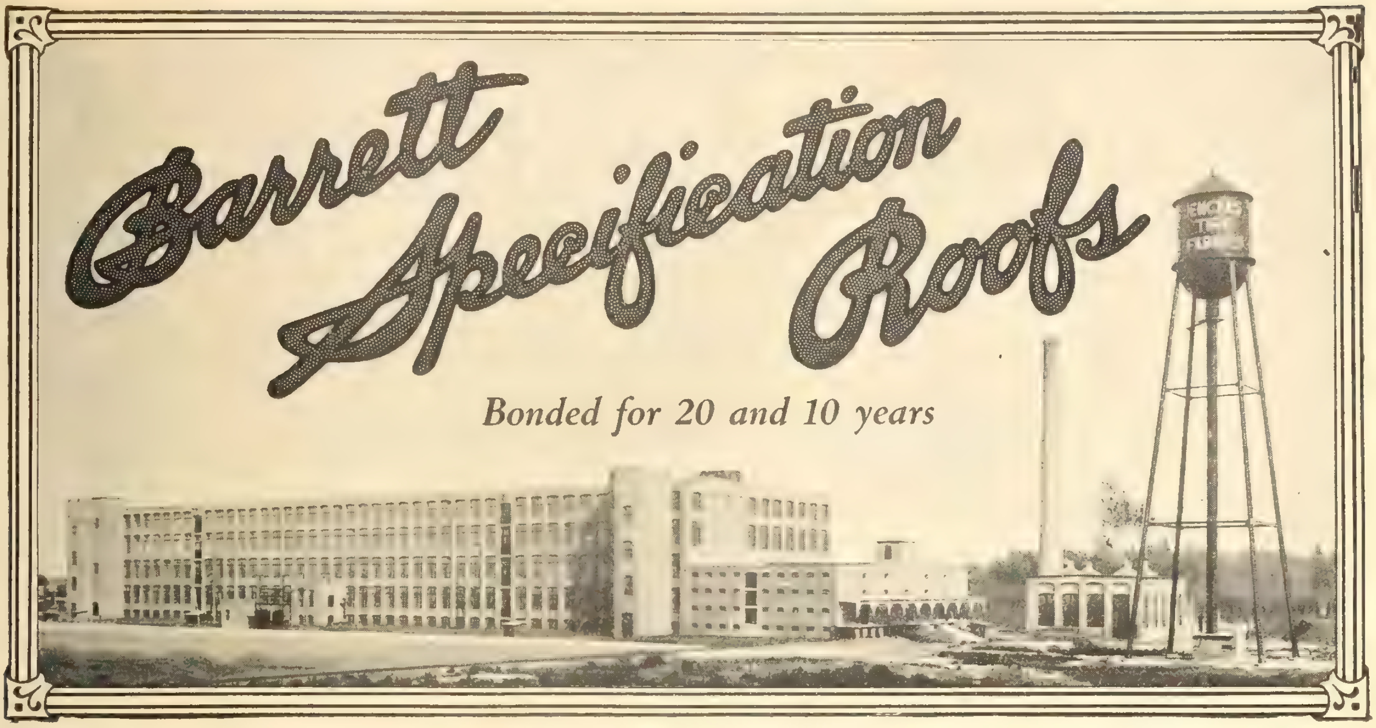

Barrett Specification 20-Year Roof on plant of Jenckes Canadian Company, Limited, Drummondville, Que. Arch.: Knight C. Richmond, Providence, R.I. Cont. & Roofer: Newton-Dakin Construction Co. Ltd., Sherbrooke, Que.

A Plant That Demanded Dependable Roofs—And Got Them

Typical of Canada's great industrial development is the splendid mill of the Jenckes Canadian Co. Ltd., of Drummondville, Quebec.

When drawing up the plans for the Drummondville plant the question of the right roof was given the closest attention. For in manufacturing Jenckes tire fabrics a very intricate type of machinery is used. A defect in the roof could easily do a vast amount of damage to the costly equipment—perhaps curtail production with a resultant loss of many thousands of dollars.

After the closest scrutiny of various types of roofs a Barrett Specification Roof was laid. For the architect knew that these roofs not only represent the staunchest and most permanent roof that is possible to construct, but that the owner is guaranteed absolute freedom from all maintenance expense for twenty years at least.

These Roofs Are Not Merely *Guaranteed* By a Surety Bond

This bond also assures the owner: (1) That the roof was laid by a skillful, dependable roofer. For only such roofers can obtain the Surety Bond Guaranty for the owner. (2) That a Barrett Inspector saw properly applied the high-grade pitch and felt called for by The Barrett Specification—applied to give maximum strength and durability. (3) That the Inspector made the famous cut test which insures that all details of the Specification have been carried out. (4) That the Inspector saw the heavy top coat of pitch ***poured*** (not mopped) and the gravel or slag surface properly embedded to insure as high a degree of fire protection as any roof can possibly provide.

The experience of hundreds of building owners all over the Dominion proves conclusively that when a roof is built by a reliable roofer according to The Barrett Specification no leaks or other roof troubles will develop during the bonded period. We can give you names and locations of many plants with roofs of this type which have been in service forty years and are still in good condition.

Barrett Specification Bonded Roofs cost less per year of service than any other type of flat roof. There are two types of these roofs—Type "AA" bonded for twenty years, and Type "A" bonded for ten years. Both are built of the same high-grade materials, the only difference being in the quantity used.

To know more about Barrett Specification Roofs write to our nearest branch. Copy of The Barrett Specification will be gladly sent upon request—free of cost.

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LIMITED

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Equipment and Supplies

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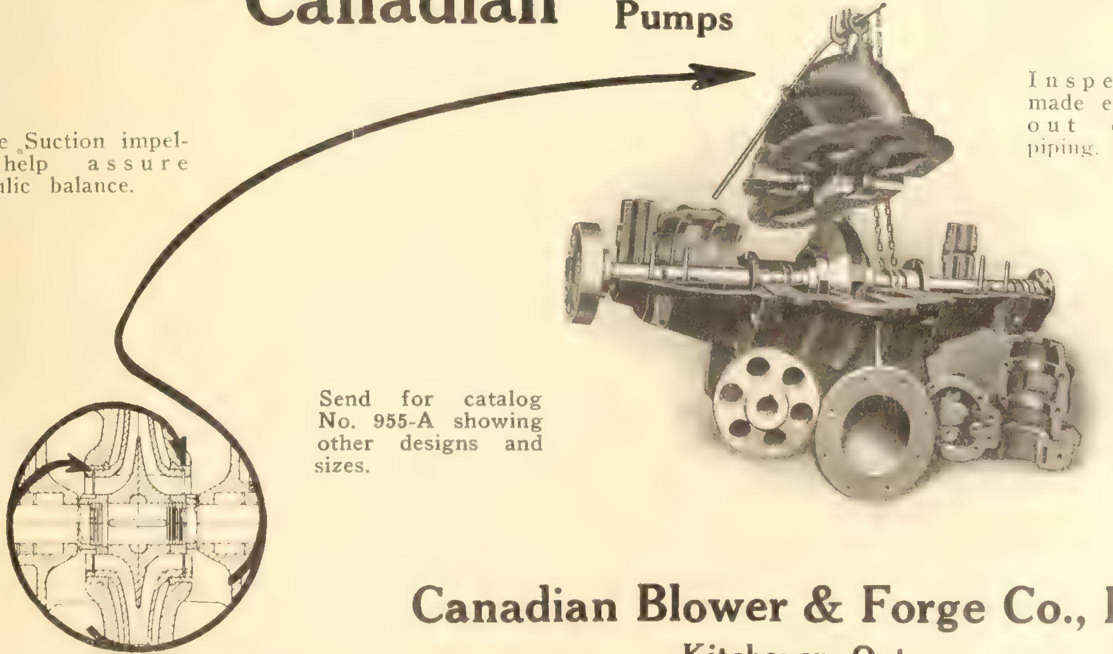

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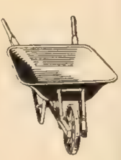

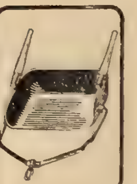

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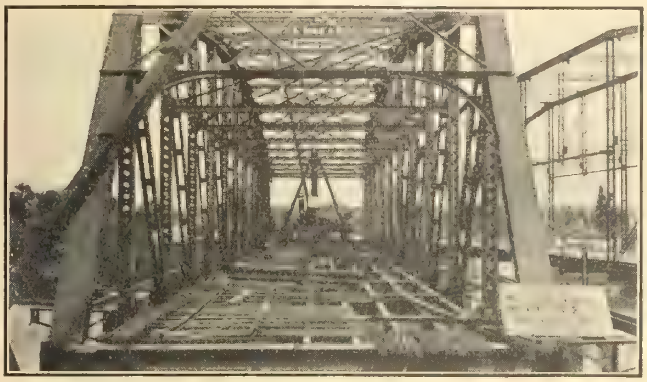

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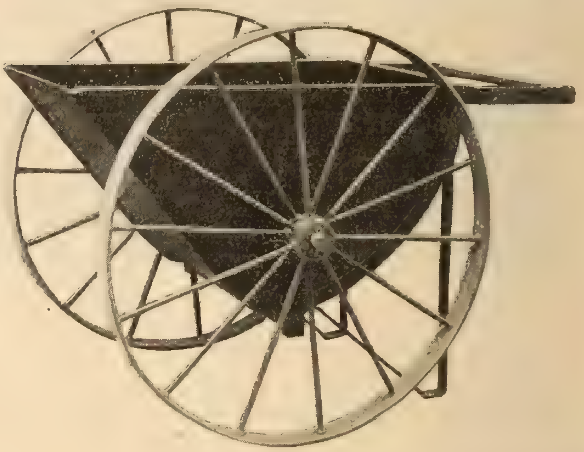

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Yours of the 11th received. Re Sidewalk and Road Paver bought last June from the Canadian Fairbanks Morse Co., and made by Messrs. Wettlaufer Bros.—in reply would say that the Machine has given every satisfaction and surprised Mr. Wilson, who had charge of the 5 miles of paving between Dunnville and Stromness. I might say that during nearly five months continuous running (Sundays excepted) altogether there would not be a half day lost time on account of breakdowns, then it was nothing serious. When we first got the machine Mr. Wilson condemned it, on account of the castings being too light, and asked the writer to get a duplicate lot of castings in case of the ones on the Machine wearing out; but we have never had to renew a casting and they look to be good for a lot of work yet.

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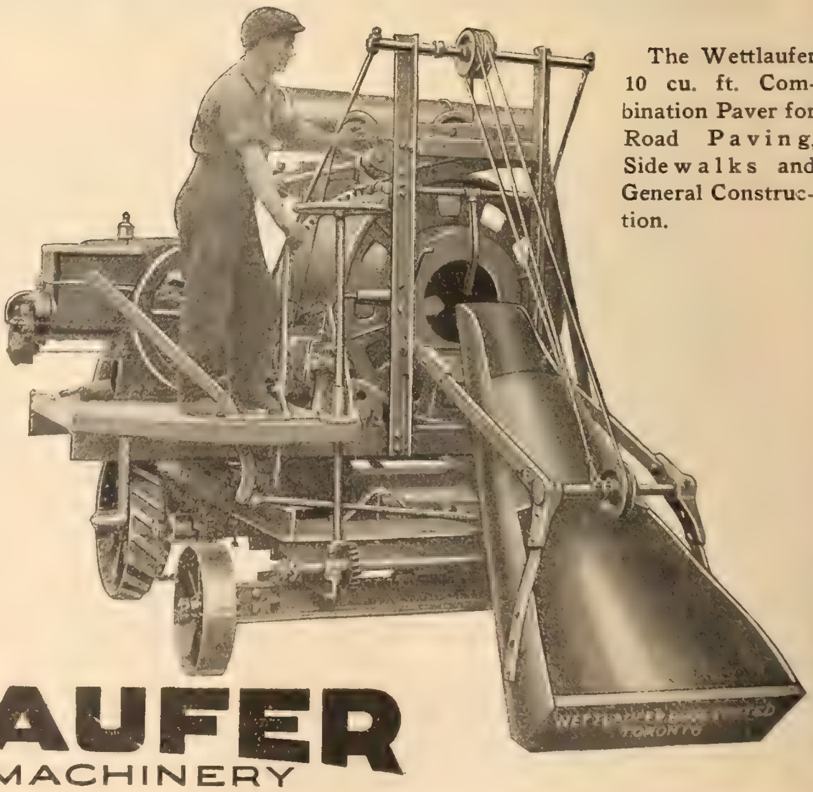

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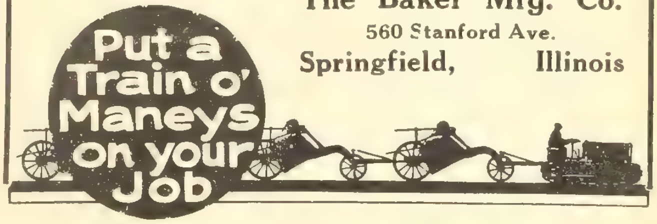

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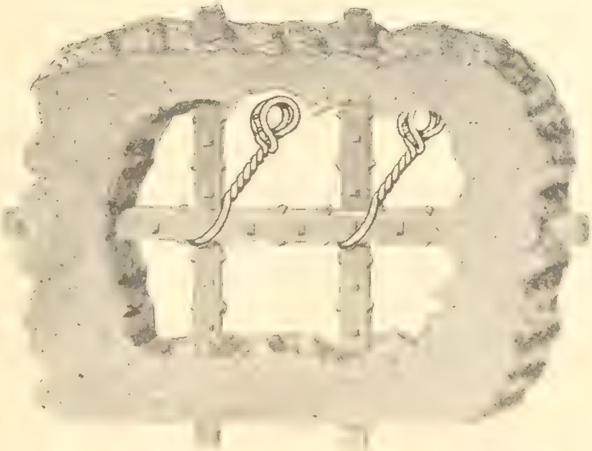

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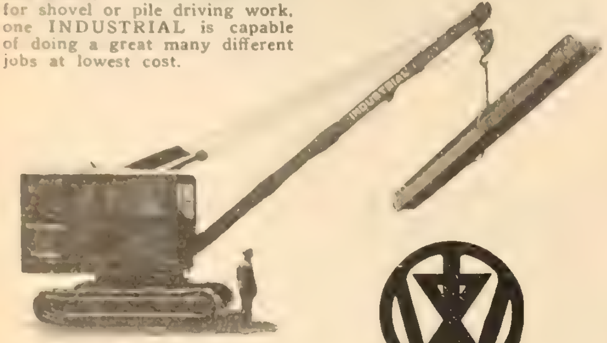

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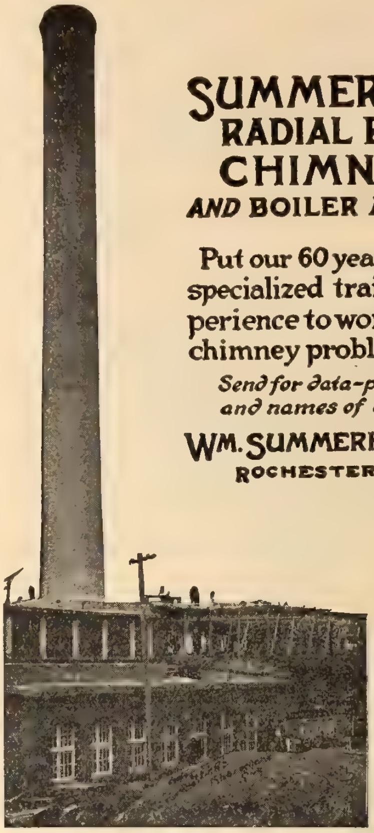

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"Handbook of Building Construction," by George A. Hool and Nathan C. Johnson. Two volumes, (not sold separately,) 1474 pages, illustrated. Published in 1920 by McGraw Hill Book Co., Inc. Price $12.00.

"Operation and Maintenance of Irrigation Systems," by S. T. Harding. First edition, published in 1917 by the McGraw-Hill Book Co., Inc. 271 pages, illustrated. Price $2.50.

"Practical Road Building," by Charles E. Foote. Just published by David McKay, 295 pages, illustrated. Price $1.50.

"Relief from Floods." The Fundamentals of Flood Prevention, Flood Protection and the means of determining proper remedies. By John W. Alvord and Charles B. Burdock. First edition published in 1918 by McGraw-Hill Book Co., Inc. 175 pages, illustrated. Price $2.00.

"Sheet-Metal Pattern Drafting and Shop Problems," by James S. Daugherty. Published in 1922 by The Manual Arts Press, 173 pages, illustrated. Price $2.50.

"Steel Bridge Designing," by Melville B. Wells, C.E. Published by Myron C. Clark Publishing Company in 1913. 260 pages, illustrated. Price $2.00.

"The Engineering Index for 1920," recently published by the American Society of Mechanical Engineers, 586 pages, price $6.00.

"Use of Water in Irrigation," by Samuel Fortier. Published in 1915 by McGraw-Hill Book Company. 265 pages, illustrated. Price $2.00.

"Use of Water in Irrigation," by Samuel Fortier. Second edition. Published by McGraw-Hill Book Company, 1916. 325 pages, illustrated. Price $2.50.

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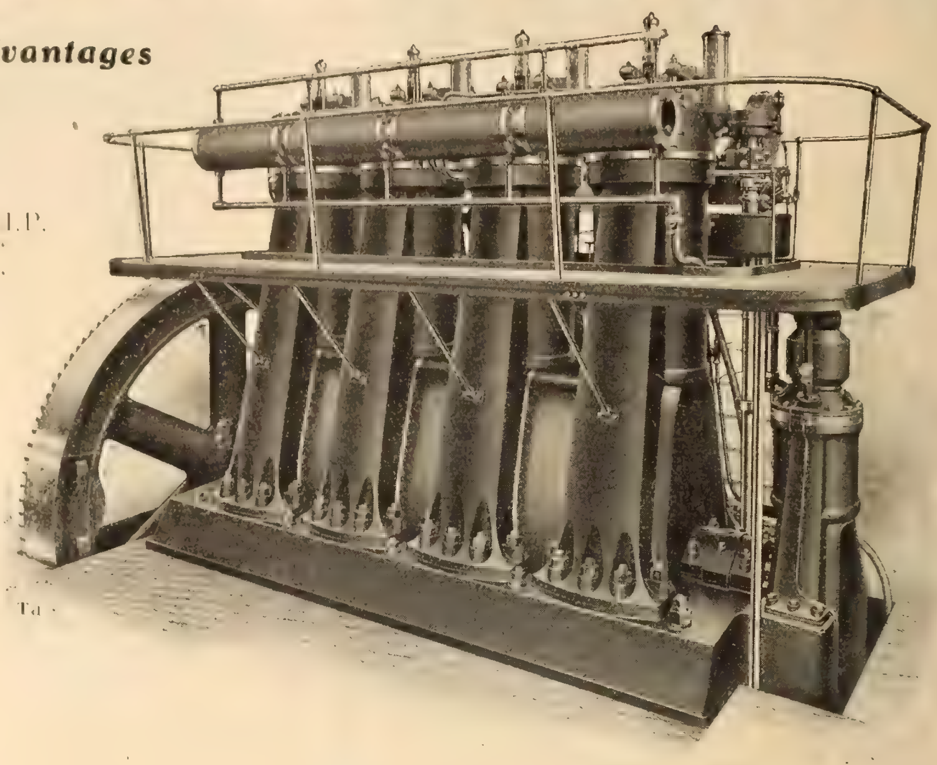

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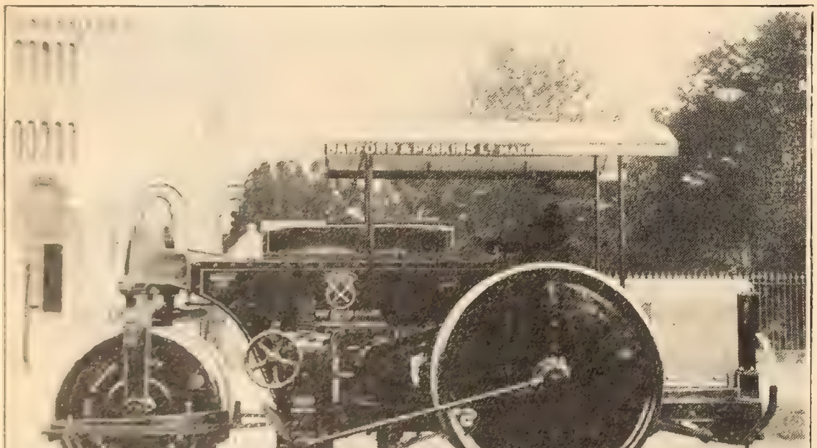

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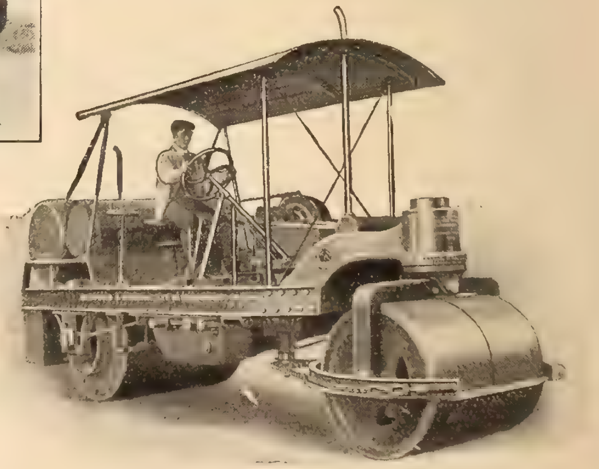

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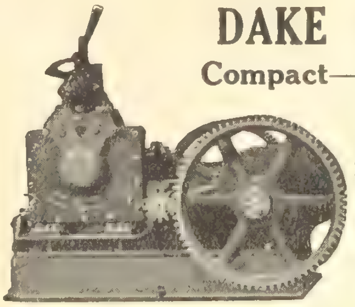

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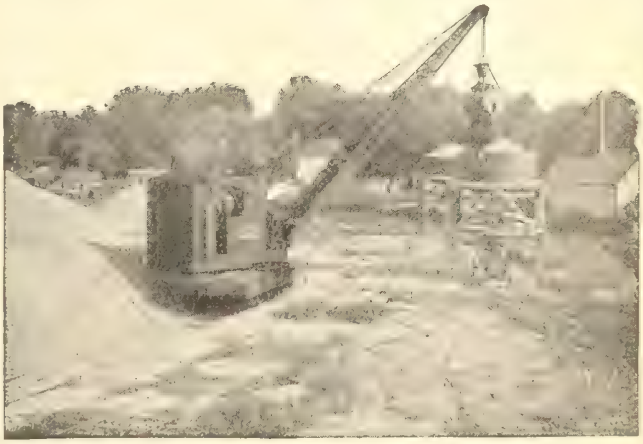

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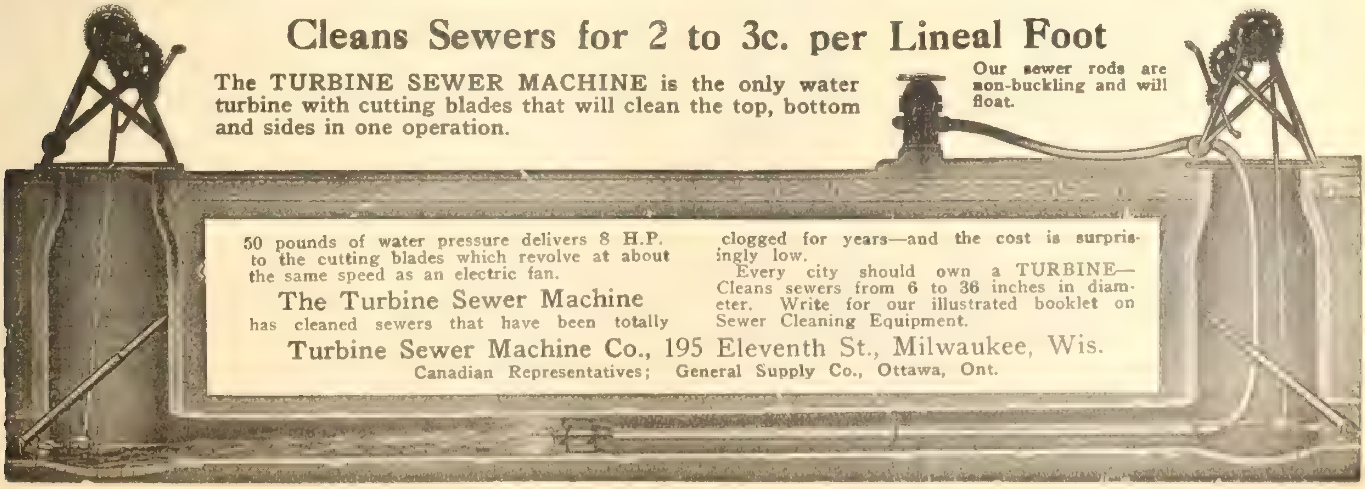

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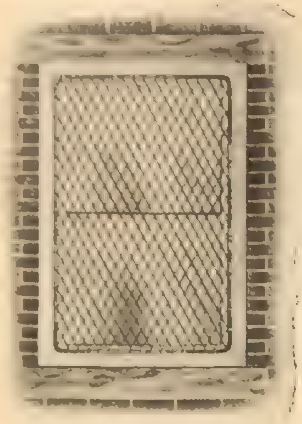

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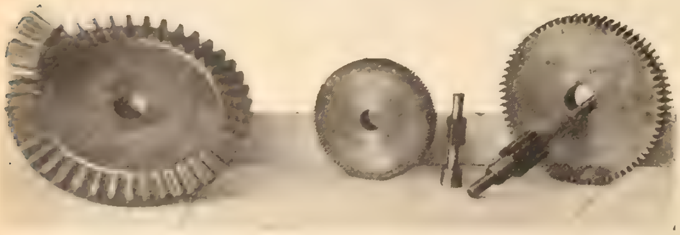

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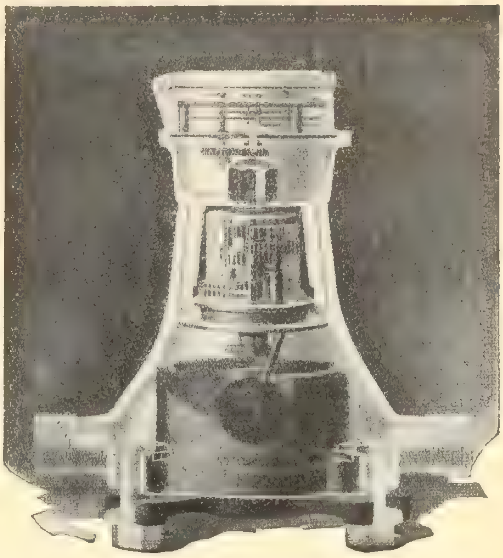

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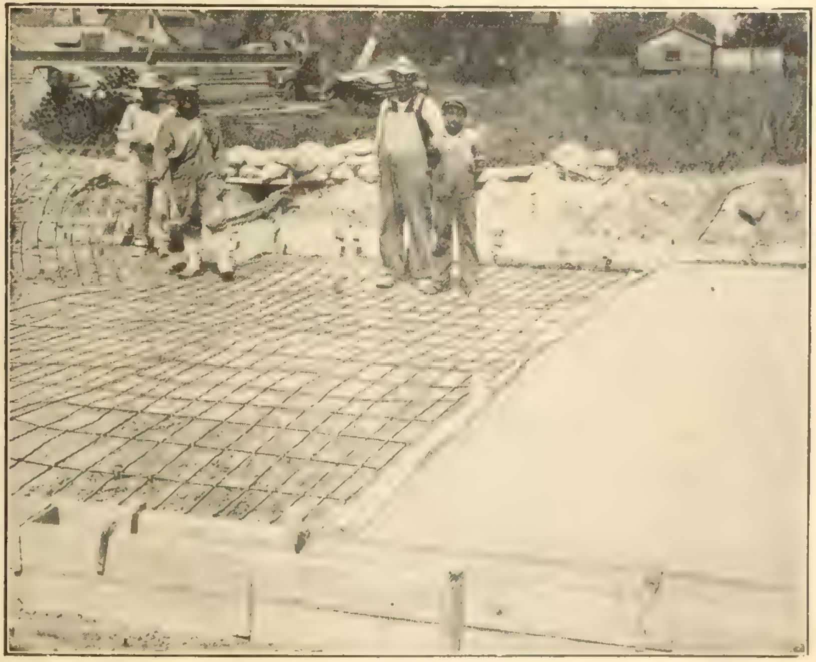

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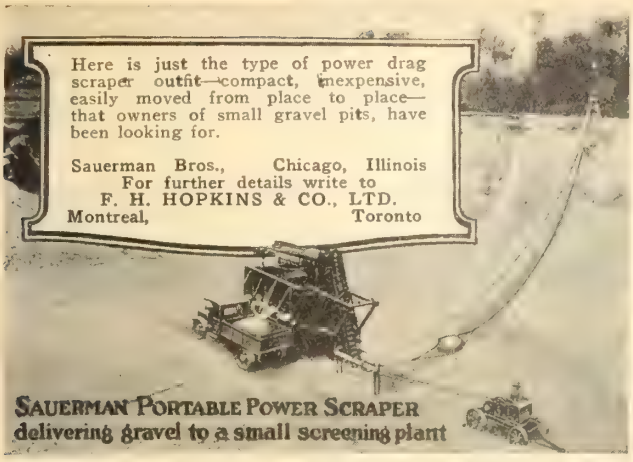
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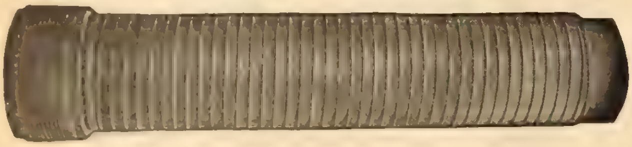

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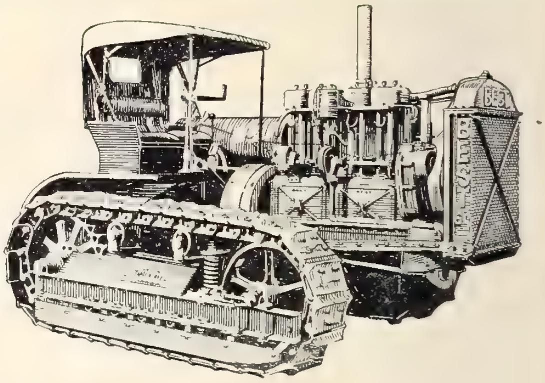

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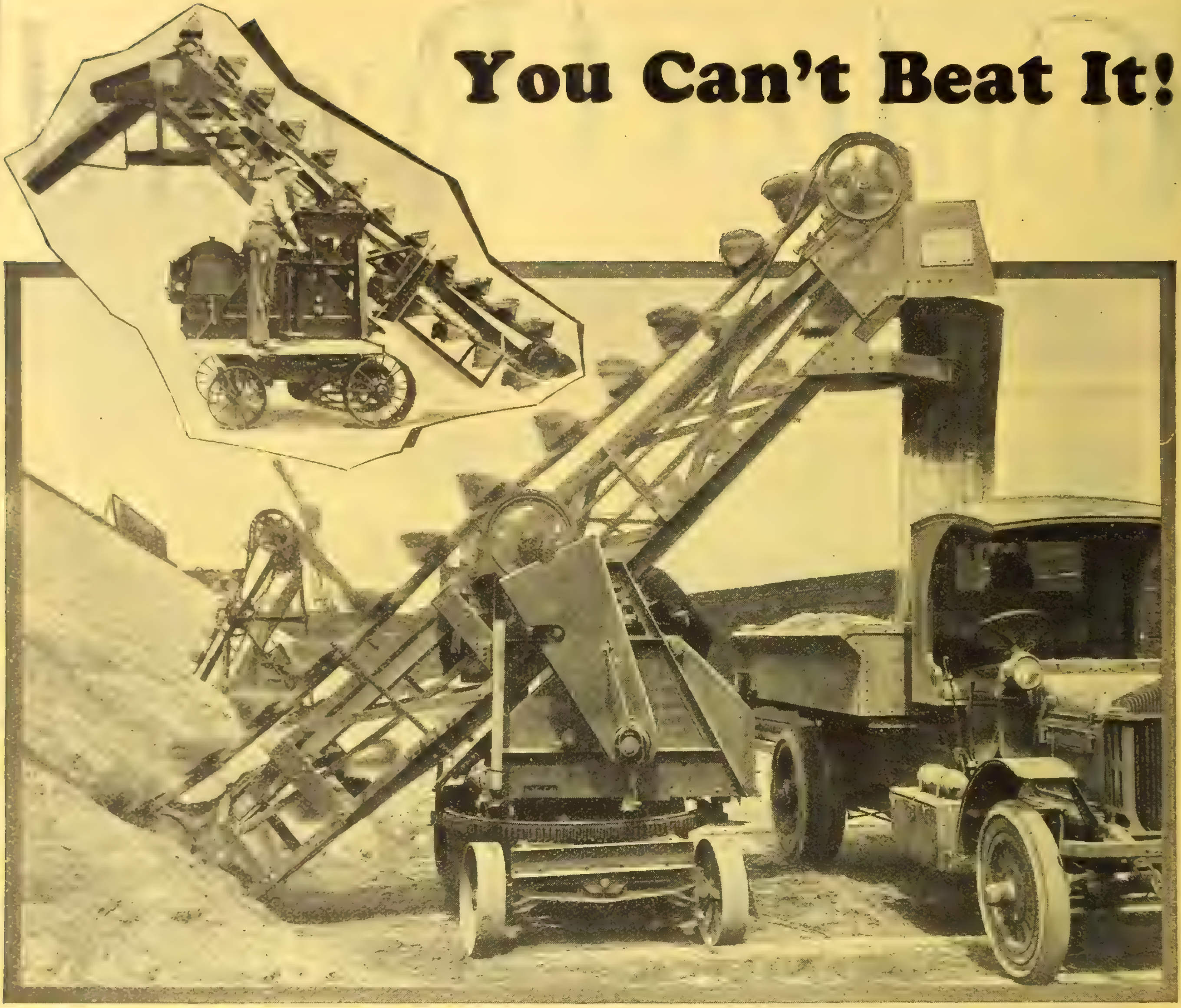

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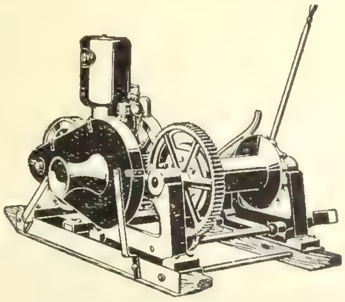

Fig. 72—London Single Drum Hoisting Engine, Type A

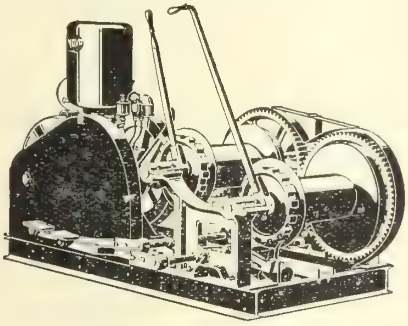

Fig. 75—London Double Drum Hoisting Engine, Type C

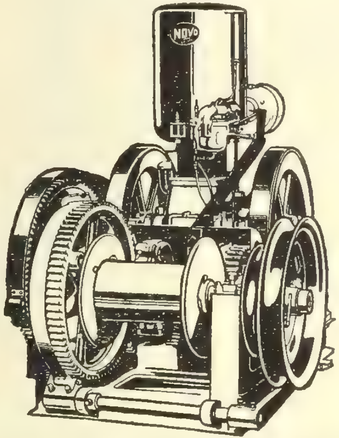

Fig. 64—London Single Drum Reversible Hoisting Engine, Type B

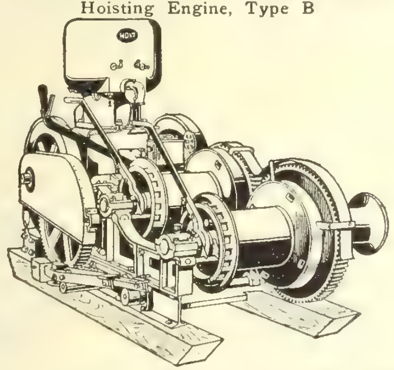

Fig. 80—London Heavy Duty Double Drum Hoisting Engine, Type E

LONDON BUILDERS' HOISTING ENGINES

are built in all sizes and styles to meet the requirements of the Building and Contracting Industry.

Gasoline Operated Hoisting Engines have revolutionized all methods of hoisting and pulling just in the same manner as the Gasoline Operated Automobile has outdistanced old methods of transportation.

WHY? Because, Gasoline Operated Hoisting Engines can be operated without experts or engineers. No night watchman required. They are easily moved, easily operated and as flexible at the throttle as the modern automobile. They meet every hoisting or pulling requirement. They cost less to purchase and maintain; less to operate and will show a substantial profit over old methods every day they are in use.

We manufacture a complete line of Gasoline and Electric Operated Hoists. Tell us your requirements and we will submit our proposal to meet your needs.

We manufacture Concrete Mixers, Hoists, Air Compressors, Pumps, Brick, Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

The London Concrete Machinery Co., Limited

Dept. 7 London, Canada

World's Largest Manufacturers of Concrete Machinery

Sales Offices and Warehouses:

R. R. Power, Halifax, N.S.
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E. A. Muir, Port Arthur.
Gorman's Limited, Calgary and Edmonton.
West Kootenay Equipment & Construction Co., Nelson, B.C.
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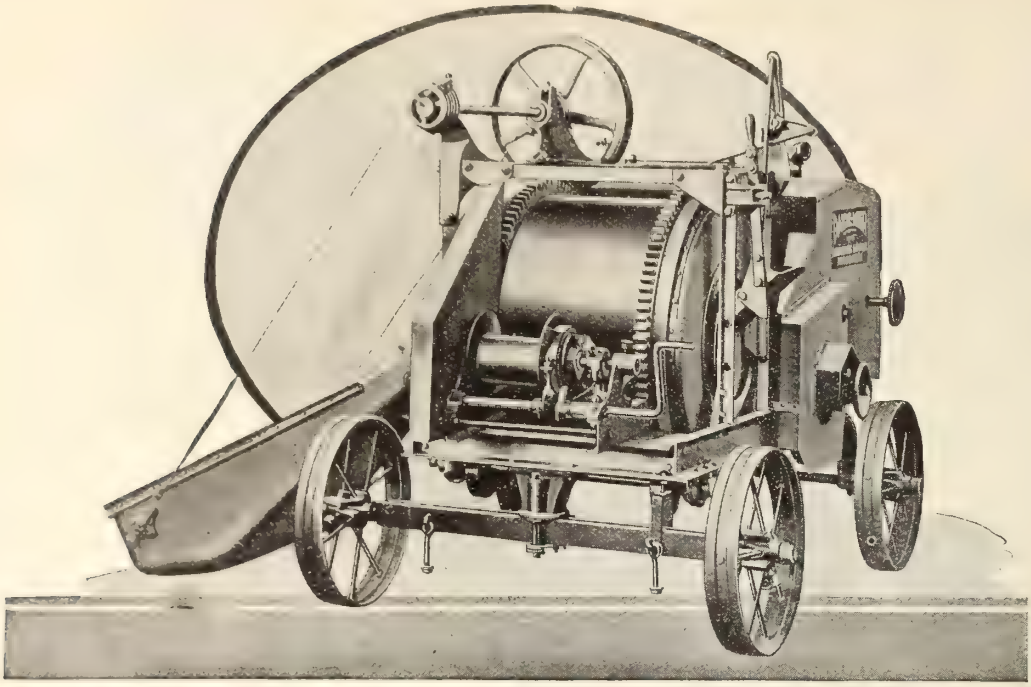

Send Coupon or write for Full Information

Mixes both mortar and concrete! Hoists.

FIRST of all the Koehring Dandie is a strongly constructed concrete mixer, but because of its mixing action it also mixes mortar. No changes needed! Always ready to go on either a mortar or concrete job. That's getting fullest use and return out of equipment investment. And in addition there is a light duty hoist attachment.

At the same time you are always ready to do a concrete job—foundations, silos, footings, culverts, sidewalks, drives, alleys, etc. The Koehring Dandie is the dependable light mixer — built with Koehring construction. Big volume production and standardization keep price down — gives you a dependable concrete mixer, interchangeable for mortar mixing at a light mixer price.

Capacities

4 and 7 cu. ft. mixed concrete. Gasoline or steam. May be equipped with low charging platform, batch hopper, automatic water measuring tank, light duty hoist, steel or rubber tires.

KOEHRING DANDIE

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Toronto, Ont.
Phone: Main 1498

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Koehring Co. of Canada, Ltd.
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Please send me Koehring Dandie Mixer Catalog No. 34 and give full information on interchangeability for mixing concrete and mortar.

Name ....

Address ....

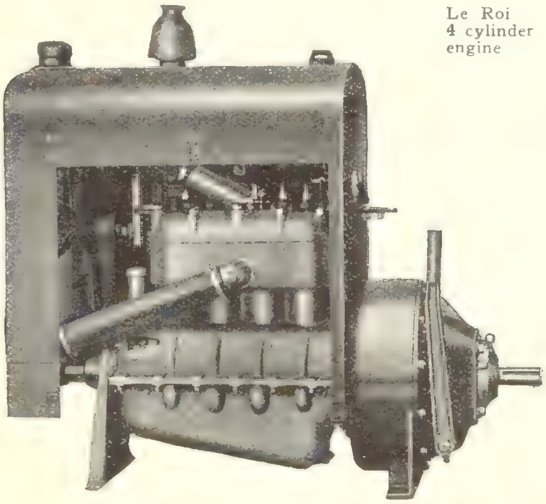
....

Save the Difference

Engine troubles are costly. Breakdowns and "stalls" cost more than you realize. You not only pay the cost of repairs, but for delays besides.

Insure your next job against engine troubles and losses by using a Le Roi and —**save the difference.**

Dependability is the keynote of engine success. And if dependability in engines is what you are looking for, there is only one answer—the Le Roi. Contractors and engineers have learned by experience that they can positively depend on a LE ROI to keep things moving. They go and keep going even under the most severe strain or abuse.



Le Roi 4 cylinder engine

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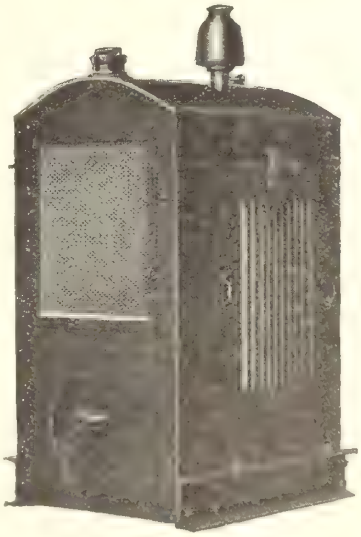

Le Roi 2 cylinder engine

LE ROI ENGINES

LE ROI COMPANY
5906 Mitchell St.
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(Continued on page 8)

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Most Builders, Contractors, Engineers and other users of Building Material who value prompt, dependable service, come to the Jno. E. Russell Company sooner or later.

Test this service with your next building requirement. One trial will convince you that Jno. E. Russell Company can most economically and "quickly" meet your building material needs

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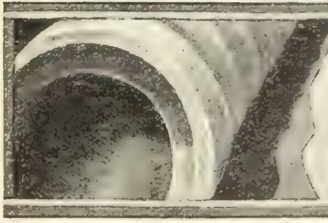

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Inglis Co., John
Koehring Co., of Canada
London Concrete Machry. Co.
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Waterous Engine Works Co.

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(Continued on page 10)

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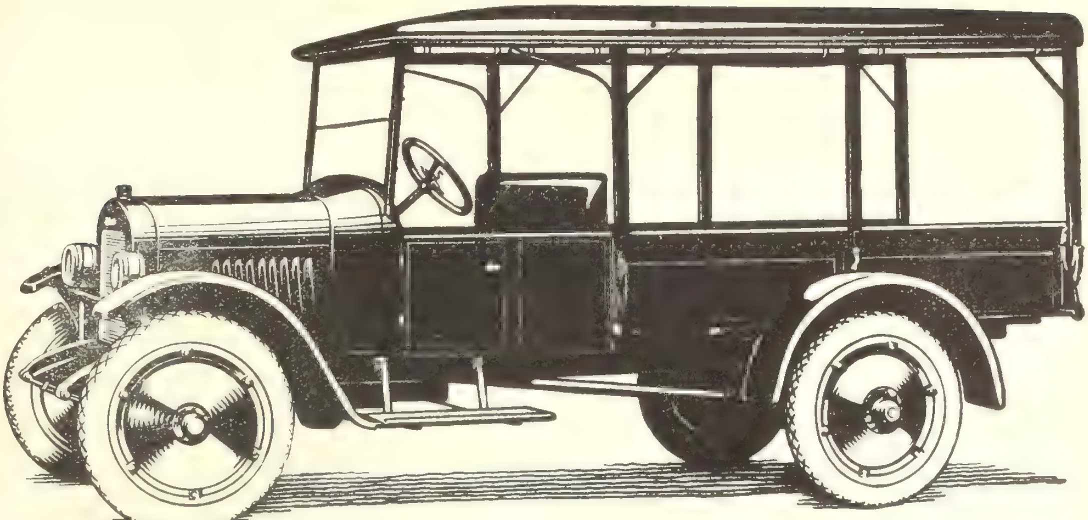
Bodies for Every Business



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Disc steel wheels—Demountable rims. Cord tires, 34" x 4½"

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Motor—5-bearing crank shaft. Pressure feed lubricating, automatic control. Removable cylinder head and block. **Matches motors of trucks costing up to $2300**

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Axles—Front, I-beam, drop-forged. Rear, spiral bevel gear, heavy Brown-Lipe differential. All Timken roller bearings. **Equal to trucks costing $2300**

Zenith carburetor, Remy ignition, starter, generator, Gemmer steering. **All found in trucks costing $2000 to $2300**

Cooling—Cellular type core, pressed steel shell. Extra strong chassis frame, 6" at greatest depth. **Equals trucks costing $2000 to $2300**

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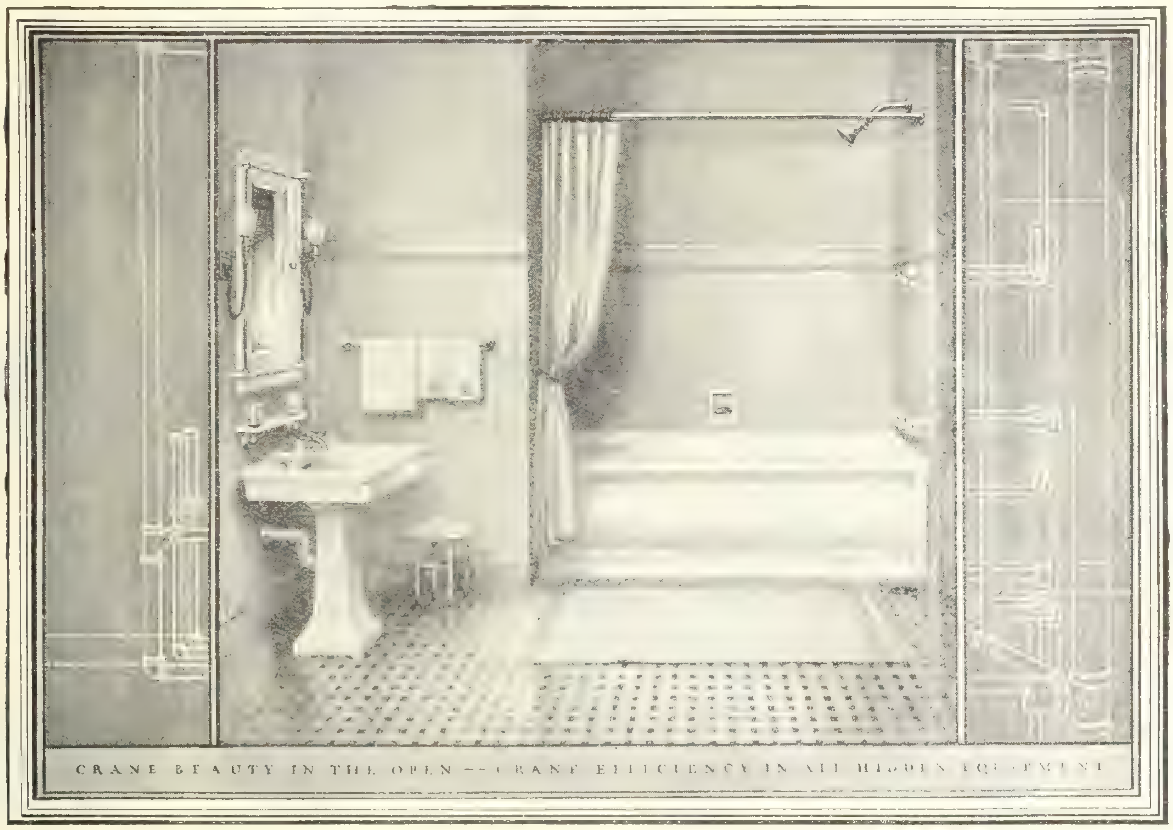

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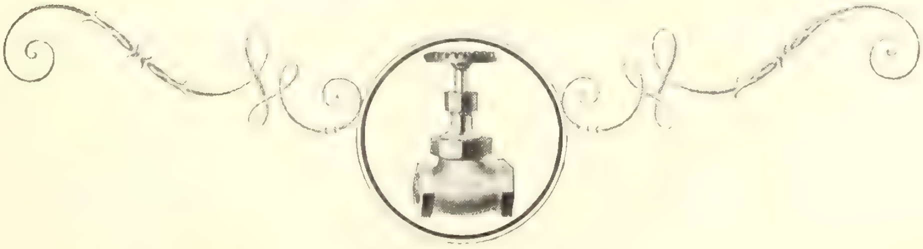

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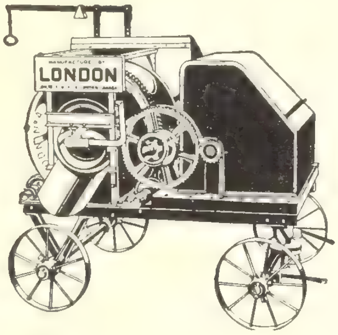

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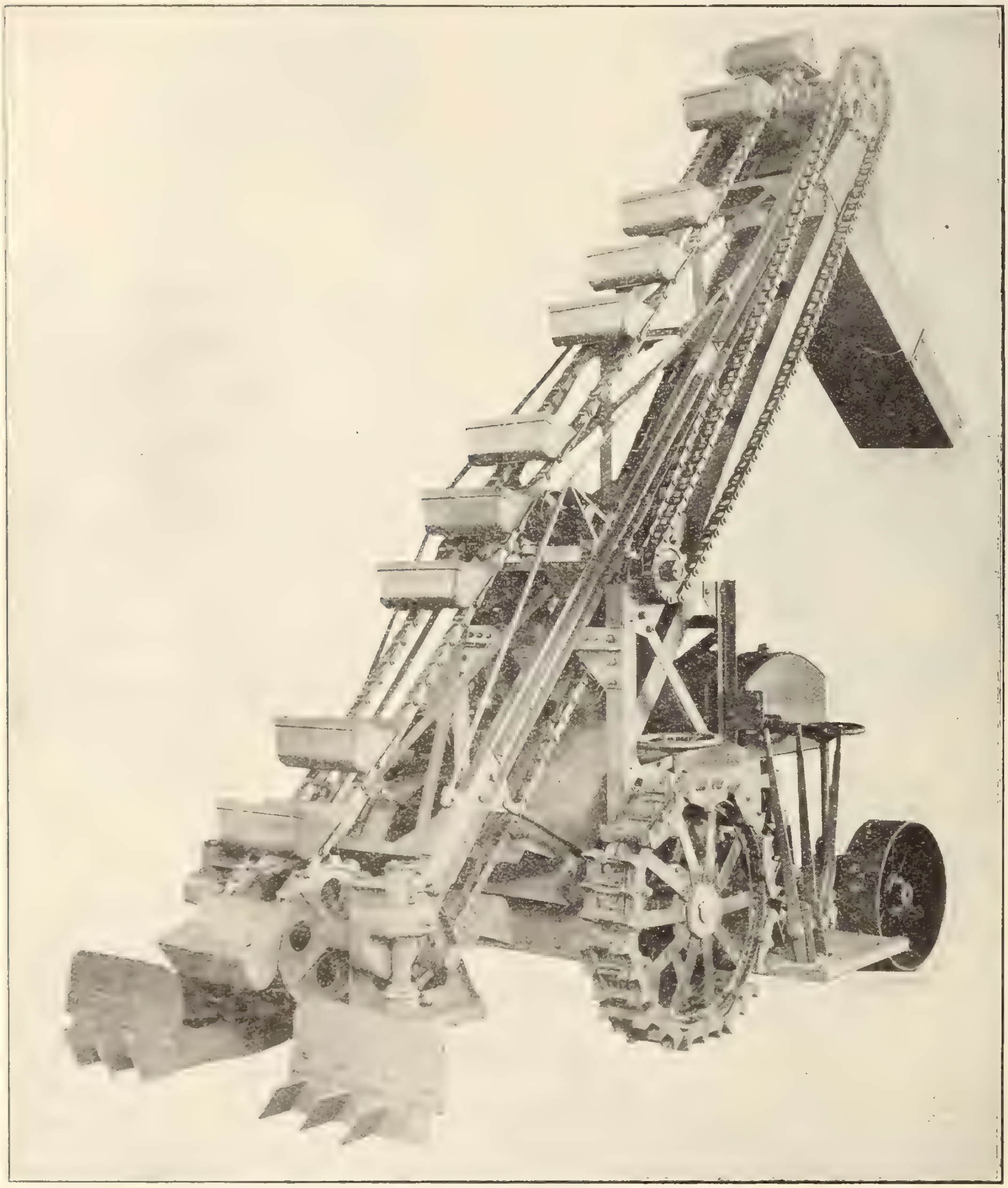

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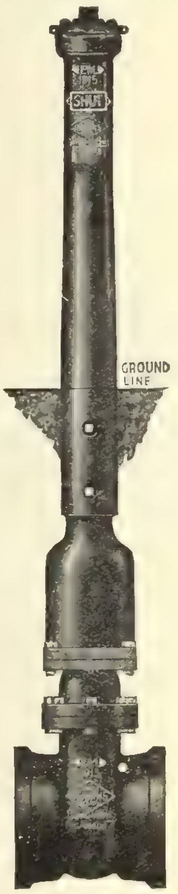

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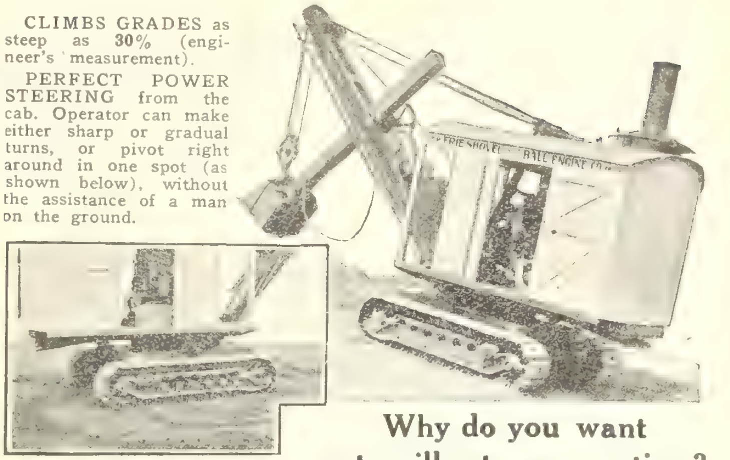

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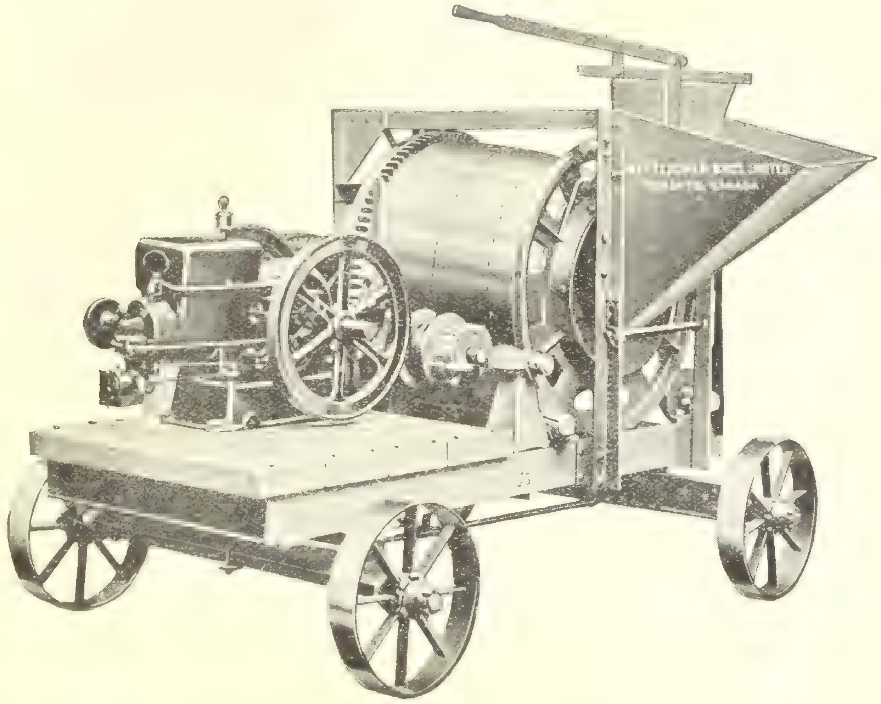

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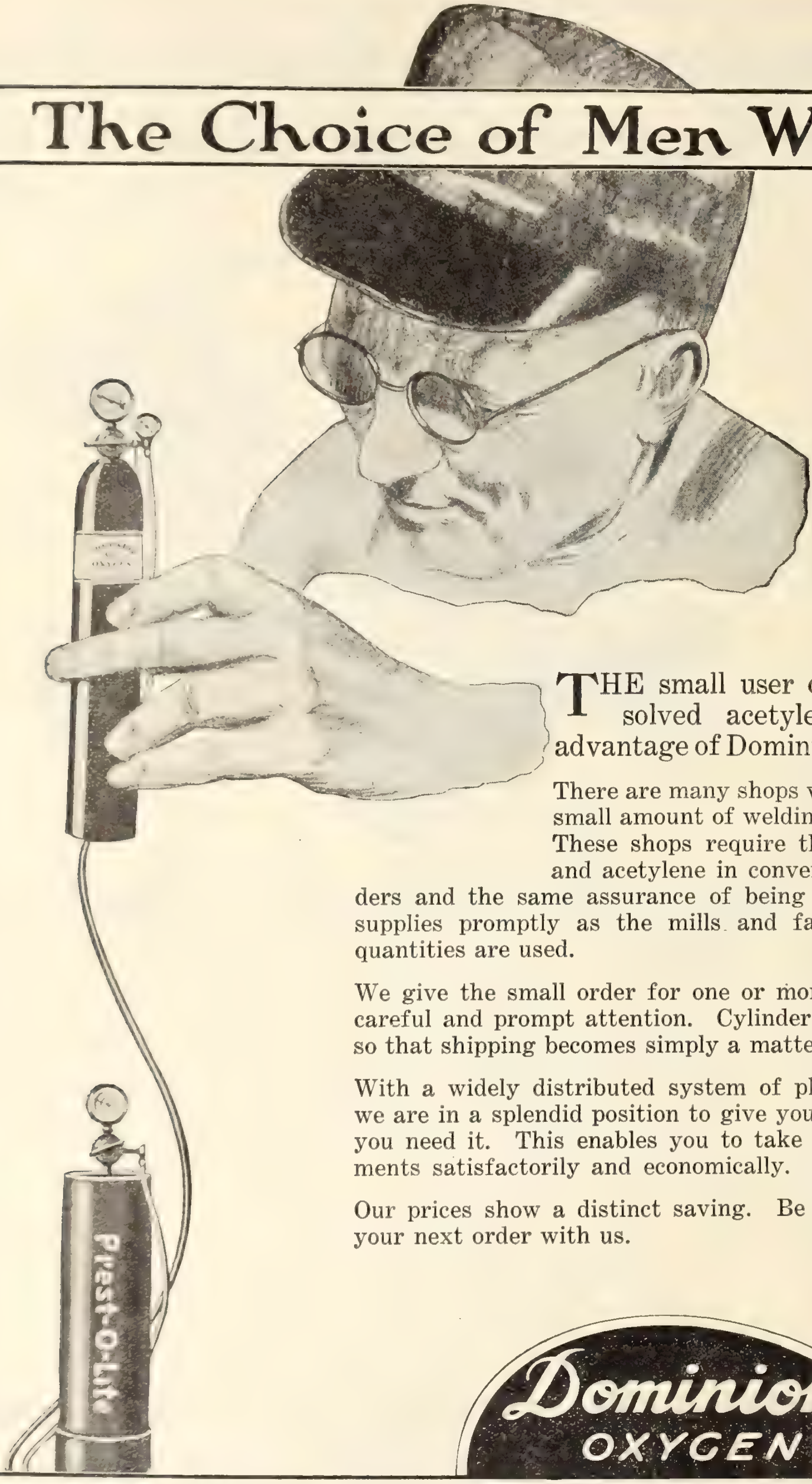

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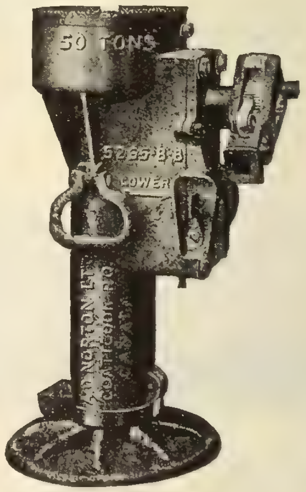

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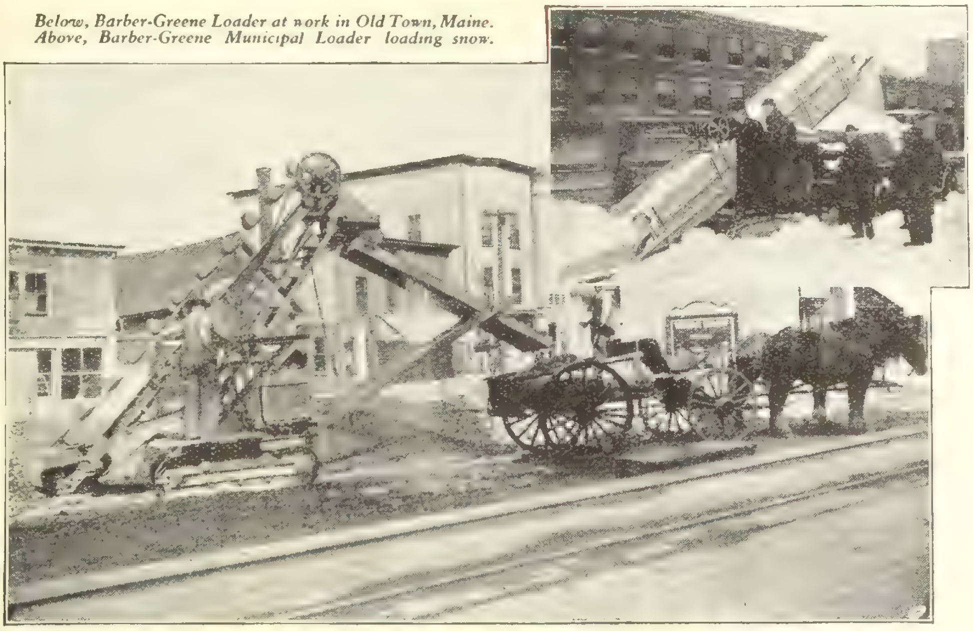
Below, Barber-Greene Loader at work in Old Town, Maine.
Above, Barber-Greene Municipal Loader loading snow.



How Old Town Handles Crushed Rock

In summer the Municipal Loader replaces a gang with one man—in winter it replaces 60 snow shovelers

IN the fall of 1921, the city of Old Town, Maine, stored a great deal of crushed stone. By spring so much sand, dust and leaves were mixed with it that it wasn't fit for use. But they had a Barber-Greene Loader. They put a ½ inch screen, 10 feet long, under its spout. Then they turned a ¾ inch stream of water across the chute.

The crushed rock was washed clean by the time it got into the trucks.

More important to most cities is the fact that the Barber-Greene Loader replaces a gang of shovelers with one man—so that the stone supply, instead of being a drag on the work, becomes a pace-maker.

In Bartlesville, Okla., a Barber-Greene was used to load stone into horse carts on city paving work and did away with all stone shoveling at the storage piles.

In Oak Park, Illinois, Barber-Greenes in 1922 were so effective in loading sand and stone that not a single shoveler was used, not even for cleaning up.

Even in Tokyo, Japan, where labor is cheap, the municipality uses a Barber-Greene to save money and speed the work. The new Barber-Greene Municipal Loader has the additional advantage of having a removable boom so it can be converted into a snow loader in winter.

Chicago says that in handling snow the Barber-Greene replaces 60 shovelers; Albany says that it is over 30 times as fast as hand labor; Boston "L" officials say that for them it is equivalent to 150 men. Because of the threatened scarcity and high cost of shovel labor the Municipal Loader will be especially popular this year. Send now for details, prices, and performance records.

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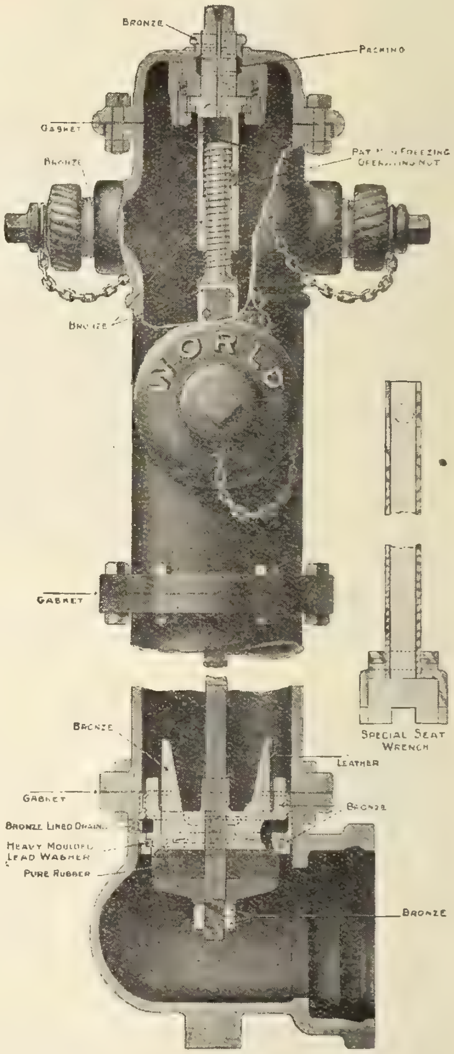

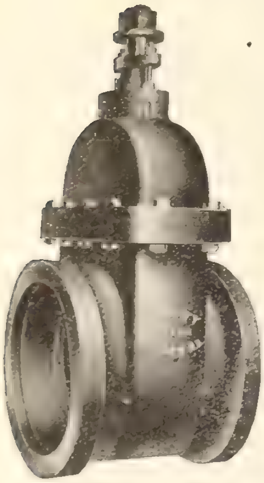

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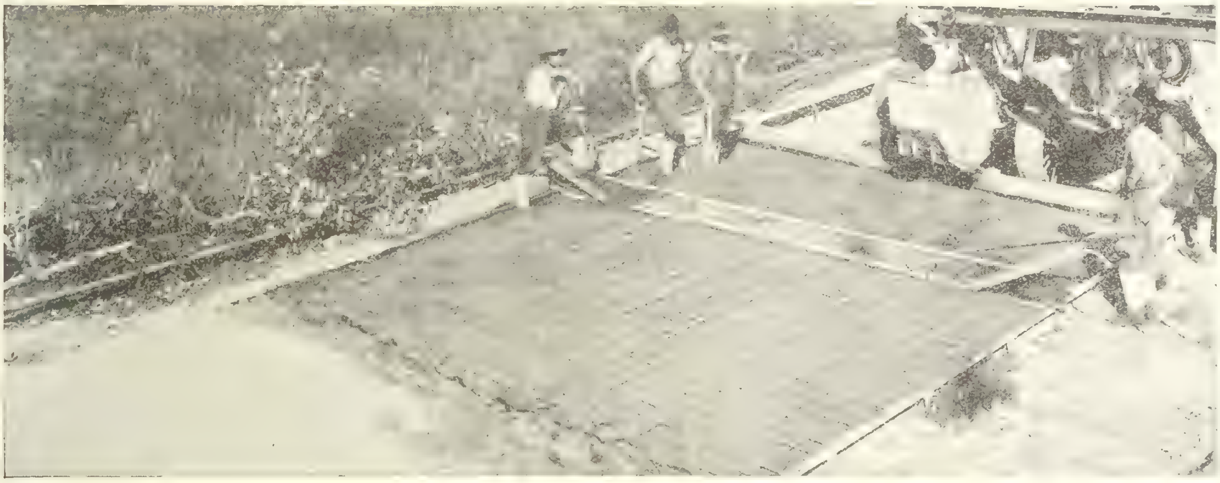
St. John, N.B. Canada.

Truscon Wire Mesh in Flat Sheets



Palestine Road, Darlington County, Pa., Chester Contracting Co., Contractors

The Economical Method of Highway Construction

Truscon Wire Mesh is furnished in widths and areas as desired, in flat sheets. The members are rigidly connected at right angles to each other so that the mesh remains in perfect form during handling.

The sheets are manufactured with the main members spaced 6″ on centres, and the secondary members spaced 12″ on centres. The sheets are cut in any desired length so that no lapping is required across the width of the road.

The complete Truscon line includes: Truscon System of Reinforced Concrete, Hyrib, Metal Lath, Lorib, Spot Grounds, Waterproofings, Building Specialties, Steel Factory Sash, Putty, Canadian Steel Casements, Rib Metal, Column Hooping, Concrete Road Reinforcement, Std. Steel Bldgs.

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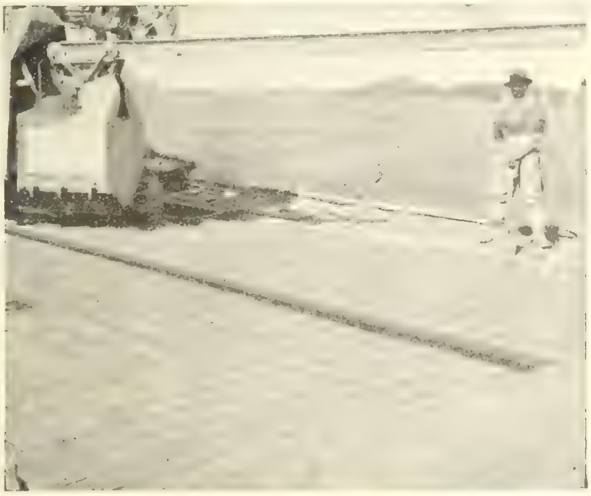
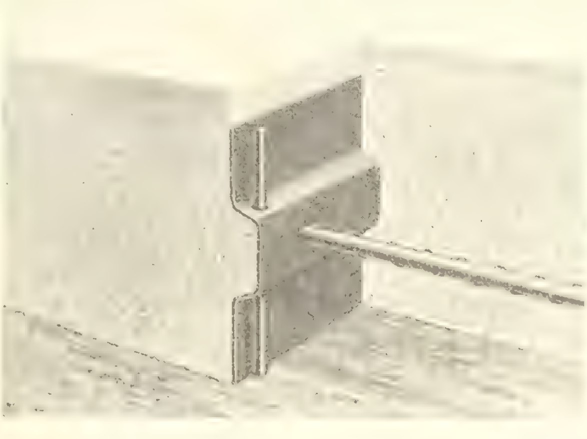
TRUSCON DOWEL CONTRACTION JOINT Made of 16 gauge plates, properly punched for ⅜″ steel stakes 15″ long, which are furnished with every joint. Specified by leading engineers in Canada and United States.



Southfield Road, Oakland Co., Mich. R. D. Baker Co., Contrs. L. V. Belknap, Eng. A central contraction joint was placed in this road.



Truscon Contraction Plate for transverse joints with slight hair crack formed by contraction in concrete over joint. Vertical steel stakes hold plate rigidly. Holes are punched in plate for tie rods.

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One of Many Satisfied Customers

Ottawa

We are using every day the No. 4 Keystone purchased from you over two years ago, and, with the exception of a few small parts which are subjected to very hard wear and naturally have to be replaced from time to time, this machine is in as good condition as when it came out of the shop, although it has excavated over **150,000** square yards of grade, almost all of it heavy macadam.

The No. 4 purchased last Spring seems to be as good a machine as the one mentioned above as it is also running every day and giving us no trouble whatever.

We have three Keystones at present, one of them being a No. 3 which has been in use for over four years and is still in good condition, and should we purchase any more excavators, which we expect to do shortly, they will assuredly be Keystones.

We want to thank you at this time for the promptness with which you have filled our orders for the few repairs we have needed, as they have invariably reached us the day after order was wired you.

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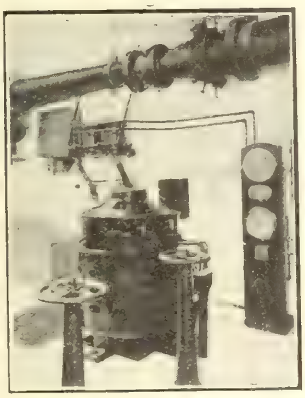

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Owing to the close competition in road building, contractors must of necessity have the most reliable and efficient machinery procurable—especially the roller which must be on the job every day and all day with no shut downs waiting for repair parts.

For this reason practically every road contractor in Canada is equipped with Waterous double cylinder steam road rollers, most of which have been purchased on repeat orders.

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Other points in favor of Waterous steam rollers are the extremely low cost of upkeep and the high resale value commanded by them.

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ESTABLISHED 1886

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Trained Men as Highway Builders is Urgent Need

The experience of the past few years that has been gained in the construction of improved highways throughout the Dominion has demonstrated clearly that there is still a lot to be learnt in the matter of building better roads, and furthermore has proved to every government and municipality that the extent to which well trained men can be brought into this field and retained is the measure of the economy and efficiency of the expenditure of the tremendous public funds which must inevitably go into the building of our public highway systems. Unfortunately for the ratepayers, and for those who use the highways as well, there has undoubtedly been a dearth of fully qualified properly trained highway builders available —perhaps because of the inducements of higher compensation, sure advancement and continuity of services that are offered by industry to the individual of outstanding personality and technical preparation, which are so far in advance of the offers made by the public service. The result has been that a great deal of highway construction has been placed in the hands of men who are not fully trained in such matters—more often than not, an analysis of such officials will prove that the majority of them are railway engineers, and while they may be qualified for that particular line of endeavor there are wide points of difference between building a railroad and constructing a highway. There are a few points of similarity such as the importance of drainage and grading, but the foundation of the highway and its surfacing, two of the most important features, are problems that the railway trained engineer is not conversant with.

It is apparent to the most casual observer that the last word has not been said in regard to either types of roads or methods of construction—experiments are continually being carried out and data obtained which is invaluable as far as it goes, but until there exists a body of trained highway builders —men versed in all the problems that confront those who undertake road construction—the progress towards economic efficiency will be but slow.

At the tenth annual convention of the Canadian Good Roads Association to be held at Hamilton on June 11, 12, 13 and 14 next, this is one of the important new features that have been added to the program of subjects for discussion—the need for specially trained highway builders. It will be introduced by a man who occupies a high position in engineering circles, who frankly recognizes this need and will explain why to the delegates, the subject being further enlarged upon by another engineer. Only ten per cent of the highways of Canada have received any surface treatment whatever, so that the field open to a properly trained highway builder is a large one, and the proposal will be put forward that the leading universities should establish courses where highway builders can specialize in this subject and through the knowledge they gain assist the municipal and provincial authorities in building better and cheaper roads. The roads of today, so often built out of capital expenditures and therefore a burden on the taxpayer for years to come, are neither fulfilling the claims of contractors nor the hopes of the public, and if anything can be done to reduce the waste and improve the wearing qualities of the highways it will be money well spent.

This is but one of the many practical questions that will be dealt with at the convention. The final program is rapidly taking shape and a perusal of it bears out the forecast that it will be the most important gathering ever held under the auspices of the Dominion-wide association.

The chairman of the executive committee, S. L. Squire, while out West recently, received the most flattering commendations of the provincial governments for the assistance the association had rendered in presenting the claims for federal aid in highway construction, and the securing of an extension of two years for those provinces which have not yet absorbed their Dominion grants. Mr. Squire is just now visiting the maritime provinces in order to line up the official delegates for the convention, and particularly for the inter-provincial conference of highway officials which will be held conjointly with the general convention. This conference is of greater importance than usual this year because of the determined fight all the provinces are going to make to get the Dominion government to make further grants for general highway improvement.

Strength of Masonry Piers

"Comparative Tests of Clay, Sand-Lime and Concrete Brick Masonry" is the title of a bulletin issued by the School of Mines, Engineering and Chemistry, of Columbia University, New York City. It describes and details the results of experiments relating to the structural behaviour of masonry piers.

The Week's Developments in a Nutshell

It is becoming clearer every day that the boom of construction work in the United States has collapsed. This is especially true of the Eastern section of the country. The News Letter of the Associated General Contractors of America placed the figure of abandoned projects in New York during the two days May 8 and 9, at fifty million dollars, and states that at least twice this amount is suspended until the work can be carried out at lower cost. A report from Chicago says "75,000,000 dollars of work held up indefinitely." These indications are borne out by the action of a group of men "representing banking, realty, construction, building materials and building labor" who met in New York a few days ago and unanimously decided to urge "a nation-wide suspension until early autumn of all new building construction save that under way or of an emergency character." The Literary Digest in an interesting article reviewing the whole situation says "consternation, in many quarters, greets the threatened collapse of 1923's five billion building boom." Our neighbors to the south then are evidently over the peak. It remains to be seen how far they will fall back. Since building is the basic industry upon which practically all other activities depend the serious nature of the situation in the United States is quite apparent.

The question we are interested in is—will Canada follow suit? Will our five hundred million building program collapse?

The developments of the past week in Canada are encouraging. Prices in the main remain constant. Some slight changes in lumber prices are recorded but the reductions offset the increases. Since last writing the carpenters' strike in Toronto has been settled with small concessions on both sides. The Montreal carpenters, no doubt influenced by the Toronto decision, are agitating for a raise. The labor market, in the main, is quiet however. Reports from manufacturing industries in general indicate steady activity—in some cases increasing. The plants of the Steel Company of Canada are working almost at capacity; the same thing is true of the British Empire Steel Corporation, the Lake Superior Corporation, the Canadian Car and Foundry, The Dominion Engineering Company. The Algoma Steel Corporation reports all four steel furnaces now operating. In general the iron and steel trade is experiencing an almost capacity volume of business. Only from a few points come reports that the construction demand has fallen off and that wholesalers are carrying considerable stock. This will tend to discourage any advance in prices.

If we will look the situation squarely in the face there seems to be no reason why Canada cannot side-step anything in the nature of a collapse. We have,—

(1) the example of the United States to guide and warn us.

(2) the fact that the demand for both labor and material has fallen off in the United States which will ease the situation of supply in Canada.

(3) The fact that we have been going along steadily, gaining momentum gradually—not working at dangerous pressure or over loaded capacity. We have thus never entirely lost the proper perspective of the situation.

We believe the main signs point to a continued improvement in the Canadian situation. Wholesale prices on the average are not higher than a year ago; it follows therefore that there is no real urgency for price advances on final products. Labor is a matter of supply and demand largely; when there is a return from the United States of those workmen who temporarily sought employment there, the labor market will ease.

Every effort should be exerted in the direction of keeping the public confidence, that fair prices will prevail. There is no evidence of slackening of demand for buildings and construction of every kind. The whole situation boils down to maintaining a relationship of confidence between the industry and the general public.

One of Montreal's Important Buildings

Henry Morgan and Co's. Extension

A New Structure Being Erected at the Rear of the Present Store—The Superstructure is Entirely of Reinforced Concrete—Details of the Design and Construction Methods

For many years past Henry Morgan & Co., Limited, has been noted as one of the best and most reliable departmental stores in Montreal, and their clientele has gradually but continuously increased until they find themselves in the present position of being obliged to enlarge their store. They also have a large building a few blocks away which is used as a factory and which will, no doubt, be vacated by them upon completion of the building now under construction.

The new building is being built onto the rear of their old store which faces on Phillips Square, and the whole structure including both old and new parts is bounded on three sides by important city streets. On the north side there will remain several small buildings between the new store and the fourth street which forms the block. These buildings also belong to the same firm, but are not all used by them. The area in the block is approximately 100,000 sq. ft.. The building formerly known as Bell's Galleries, which was moved recently, occupied a part of this area but was shifted to another place further north. A detailed description of this process appeared in Contract Record of May 16th.

The newer part is to be incorporated with the older part and will be used as a store and factory, the factory occupying the upper five storeys.

Description in Detail

The building under construction is a reinforced structure throughout made up of a commodious basement and three storeys above ground level. The ground floor and the two floors above will be set apart to increase their merchandising capacity and the remaining five storeys will be used as a factory. The greater portion of the new store will be in that part of the block bounded by Union Ave., and the remaining part will face east onto Aylmer St. The length along Union Ave. is two hundred and eighty-five feet and the length along Aylmer Street is one hundred and forty-two feet while the width from one street to the other is one hundred and sixty-eight feet. These are all outside measurements and the useful space is reduced by the thickness of the walls which are fairly heavy. Thus the area per floor is about thirty-six thousand square feet. The height from street level to roof is one hundred and thirty feet, the maximum allowed in Montreal, and the ground floor is about six feet above the sidewalk on the Aylmer Street side and practically flush on Union Ave. So we have a height of one hundred and thirty feet from ground floor to roof giving a distance of sixteen and one quarter feet from floor to floor.

Foundations

The soil encountered over most of the area down to basement level, fourteen feet, was blue clay with occasional layers and pockets of quicksand. The topsoil was loam. The excavation was done by means of steam shovels which dumped directly into auto-trucks. The auto trucks reached the lower level by means of heavy wooden ramps and were assisted up and down by a steel cable leading to a Beatty hoisting engine, the grade on the ramp being too steep to permit the truck engine to navigate it alone. Also the ramp in damp weather became too slippery to allow the wheel of the truck to grip so its own engine was useless. Several ramps led into the excavation from different points to prevent overcrowding, and permit of alternative means of exit and entrance. There were about thirty thousand cubic yards of material taken out down to basement level before any start was made on the piers. The bases of the piers average seventeen feet below basement floor level and they rest on clay hard-pan which is the same material they found in the excavation across Aylmer St. for the boiler house. This stratum was found to be extremely hard to continue for sufficient depth before changing its nature to allow them to impose heavy loads with perfect safety. The caissons were of wood sheeting of the open type and the material inside the caisson was excavated by an orange-peel bucket of the plunger type. Blue clay mixed with quicksand was encountered throughout the full depth of each caisson and no unusual problem arose during the process. There were forty-two piers, exclusive of wall piers and the total excavation was six thousand cubic yards. The wall piers were placed on the same stratum as the interior piers and the excavation was made in the same way. All piers were square and the sheeting was driven down by a pneumatic hammer.

The piers and wall footings are of reinforced concrete, a 1:2:4 mix being used throughout and unusual care being taken in the mixing and placing in order to obtain as great a compressive strength as possible. In this connection they followed the Duff Abrams theory of mixing as closely as possible, although this theory does not consider an arbitrary 1:2:4 mix as being suitable in all cases regardless of what aggregates may be used. The principle of the theory is that there shall be a certain relation between the amount of water and cement used. In other words if W/C is a minimum the concrete will be stronger than if W/C is greater. The workability of the mix has an important influence on this factor which should be kept as low as practicable.

The piers and walls in that part along Union Ave. were stopped at a certain elevation to permit them to move the building mentioned previously.

Forms were placed inside the caissons and braced directly against the walls of the caissons. The Timber forming the caisson walls was afterwards salvaged and the space around the piers thus left was back-filled.

The piers are of various sizes depending upon the load which they will support. The largest one is

5 ft. square and the smallest one is 4 ft. 9 in. square. They are designed to carry a load of 170,000 per sq. ft. which is the allowable reaction of the soil. A soil bearing test carried out on the hardpan showed them that they could safely impose 10 tons per sq. ft. without causing any depression.

Superstructure Frame

The whole superstructure is of reinforced concrete, no structural steel being used in any part of the building. The wall columns are square or rectangular in shape depending upon their position in the building. The rectangular columns are designed to carry the same load and were adopted as a means of narrowing the thickness of the wall.

Most of the interior columns are circular though there are some of rectangular cross section. The round columns will prevent a more pleasing appearance when finished, and have been used wherever possible. They also have the advantage of presenting no sharp corners to the danger of being continually chipped by passing trucks. This applies more to the upper storeys where manufacturing will necessitate the use of trucks. Circular steel forms were used in some cases and wooden forms in others. The steel forms were held in place and braced by circular steel clamps which are adjustable within certain limits and collapse when stripping. They occurred about every 2 ft. in the height of the column, and effectively reinforced the steel plate against buckling under the action of the concrete when it was being poured.

The columns in the basement are 36″ in diam. and those on the top floor which support the concrete roof are 22″ diam.

The floors are of the Bransom type framed into heavy girder beams supported by the columns. The small beams are on 2′-1″ centres and support a thin slab of 2½″ thickness. Each small beam is 5″ wide and 12″ high and contains 2′-1″ bars as reinforcing bent up at each end to provide against shearing stress at the ends of the beam, and carried well across the girder beam to a safe anchorage. No stirrups are used in these small beams. The slab is reinforced in the transverse direction by light steel rods 1/4″ thick and spaced 18″ apart, to take care of the stresses in the slab between the beams. On the 3 lower floors there will be a hung ceiling to cover up these beams and present an unbroken surface. Steel pans preshaped were used as forms and supported by wooden joists braced to the floor below. In the case of the girder beams wooden forms were used which is common practice.

The Morgan departmental store as it will look when completed

The columns are not equally spaced over the whole area which makes the floor panels of various areas and this in turn makes the columns of various sizes. The amount of reinforcing therefore varies according to the size of the column and the load on it.

Exterior Walls

The exterior walls are of artificial stone made by the Canadian Benedict Stone Co. Ltd., and colored to represent red sandstone in order to conform to the stone in the building. The imitation has been very well done and to the ordinary examination it would appear to be natural red sandstone. When completed the building should present a very pleasing appearance, with red stone showing on all exterior surfaces. The brick backing on the lower three walls is plain brick which has been salvaged from buildings that were demolished. This will effect quite a saving in buying brick. The interior of the walls on these three floors will be furred and plastered so that it matters little what kind of brick is used for backing. On the five upper storeys a higher grade of brick will be used for backing as the brick will remain exposed. The furring mentioned above in connection with the three lower floors will be 4" terra-cotta interlocking tile. The finishing coat of plaster will be applied directly to this tile.

Interior Walls

The principal part of each floor will be free from partitions of any kind, but around the elevator shafts, stairways and lavatories they are going to use 8" terra-cotta interlocking tile and apply the finishing coat of plaster direct to these.

Interior Finish

It was mentioned in a previous paragraph that the uper five storeys would receive little if any finishing but a better grade of brick would be used on the exterior walls and the columns left bare. They have been particularly careful in mixing and pouring the concrete so that they appear now almost as finished with a grouting coat. It is very doubtful if nicer concrete work has been done in Montreal at any time and this in spite of the fact that they have rushed the job along very quickly.

On the lower three floors plaster will be applied to terra cotta furring on the walls and directly to the concrete columns. The colour scheme hasn't been decided upon as yet.

The entire interior finishing is being done by Henry Morgan & Co's own staff as they have been interior decorators and plaster contractors for some time and have executed some big jobs for other clients in the city. The work of this department is of a high order and they are often called in on important work where expense is the secondary consideration.

Floors

The floors throughout the entire new building will consist of a 2½" cinder fill on the main slab and thoroughly rolled and a 1" layer of neat cement grout as a wearing surface. Expansion joints of an approved design will be inserted at stated intervals to provide against the danger of cracking. On the three lower floors they will no doubt provide an additional wearing surface that will be easier and quieter under foot but this hasn't been decided as yet.

Rate of Progress

Work was started on Oct. 1st 1922, when they brought in some steam shovels onto the site. Previous to this they had spent some little time demolishing the old buildings which occupied the area. Excavation was carried on simultaneously in an area 142 ft. along Aylmer St. by 168 ft. across the block to Union Ave. This area was dug out to basement level by Dec. 1st. In the meantime a start had been made on the demolition of buildings on Union Ave. which still remained standing and this was completed about six weeks later. During this demolition work a start had been made on the caisson work for the piers in the area already excavated and the first pier was poured near Aylmer St. on Dec. 15th. From this date on the piers were rapidly placed; about one pier per day being an average.

The building which they moved up Union Ave. about 260 feet was occupying part of the area just south of that part first excavated. The older and smaller buildings on either side were being demolished during December and January. Excavation in this area on either side of this building could not be completed for fear of endangering its stability so that it wasn't finished until just recently after the building had been moved to its new position. At time of writing this work has all been done and piers are all in place.

Present Stage of Constuction

Our correspondent went over the building on May 21st, and found it in a well advanced stage of construction. In that part facing on Aylmer St. the concrete superstructure is finished to the top and they are busy on electrical work, plumbing and exterior walls. The artificial red stone is being laid by Canadian Benedict Stone Co. Ltd., and the backing is being done by the. G. C. They are up to the level of the second storey with this wall. In that part on Union Ave., which really occupies about two-thirds of the actual site, they are just now erecting forms for the ground floor columns, everything being completed to ground floor level. They expect to finish a floor every two weeks until roof is poured, which will carry them along until Sept. 1st next. On the Aylmer St. side they progressed faster than this, the ground floor being poured late in February and the roof early in May.

Equipment

A three-quarter yard Smith mixer is set up in the basement about 30 ft. in from Aylmer St., and a concrete hoist for raising the bucket has been carried up through the floors to the roof. This is the opening where the regular elevators will run. The various ingredients forming the concrete are dumped into chutes which lead in through the basement windows from the street outside to the basement floor and from thence are wheeled up an incline to the north of the mixer. The hopper on the hoisting is placed in position at any desired floor. Other materials which have to be raised above ground floor level are handled by a separate Beatty hoisting engine which operates a cable in an opening alongside the concrete hoisting tower and nearer the street. The derrick boom is fastened to the hoisting tower and reaches to any point in this 20 foot opening. The blocks of stone forming the outer walls are raised into place by three separate derricks fastened to the edge of the roof and swinging through 180 degrees.

The whole system is remarkably well organized and no interference takes place in spite of the various parts of the work under process and the large number of men around. The sub-contractors are all hard at work.

Mr. J. J. Shea is chief superintendent for the general contractors and the organization is due to his efforts. He says they have had as many as three hundred men working in one shift. A smaller night gang has been carried almost continuously, numbering ninety men at most.

The cost of the building when completed will reach almost $1,500,000. The cubic content of the building amounts to approximately 300,000 cu. ft. omitting the basement, so the cost per cu. ft. is about $[illegible]

Contractors & Sub-Contractors.—General contractors, Henry Morgan & Co. Ltd., owners of the store; Canadian Comstock Co. Ltd., electrical work; Canadian Benedict Stone Co. Ltd., cut stone, (artificial); Kendall Bros., sand; Morrison Quarries Ltd., broken stone; J. P. Dupuis Ltd., all lumber and timber; British Empire Steel Corporation Ltd., reinforcing steel; Canada Cement Co. Ltd., cement, terra cotta tile; Plumbing, plastering, bricklaying and interior finishing by general contractors; Canadian Tube & Steel Products Ltd., piping; Minogue Trucking Co. Ltd., cartage contractor.

New District Engineers for the Asphalt Association

The Asphalt Association, of which J. E. Pennybacker, is secretary, announces the creation of two new district offices for field work and the appointment of two field engineers to succeed James R. Valk, deceased, and John B. Hittell, resigned. A third district engineer will be appointed shortly.

The southeastern district of the Association of which the late Mr. Valk was manager, has been undergoing reorganization, the headquarters having been moved from Atlanta, Ga., to Charlotte, N.C. Mr. Valk's successor is Lloyd D. Smoot.

As successor to John B. Hittell, who resigned recently as district manager in Chicago, to accept reappointment to his old position as chief street engineer, Chicago Board of Local Improvements, the Association has appointed George W. Craig, for many years city engineer of Calgary, Alta.

Arrangements are being made by the Asphalt Association to open a new southwestern district office shortly in Kansas City, Mo., and announcement as to the engineer to be placed in charge of this district will be made shortly. With an office established in Kansas City, the Asphalt Association will have a total of five district branches, located at Kansas City, Mo., Chicago, Ill., Charlotte, N.C., Albany, N.Y., and Newark, N.J. The main offices of the Association are at 25 W. Forty-third street, New York.

Letters to the Editor

Engineers in Public Life*

Editor, Contract Record:

In reply to your question should engineers enter Parliament in larger numbers, I would like to emphasize the following. At least four of the main departments of any government, namely, those of public works, railways and canals, mines, and fisheries have to deal with the development of the natural resources of the country, the transportation of these products from one point to another, and their ultimate utilization. These are problems of an engineering nature and could be handled to best advantage by trained engineers.

Some reasons why there are so few engineers in parliament are,—

(1) The training given in the engineering courses of our universities lays more stress on the purely technical side of engineering than on the business or executive side.

(2) The engineering profession is essentially a constructive one and the engineer feels, perhaps wrongly, that there would be a limited use for his talents in parliament.

(3) The business of the engineer does not lend itself readily to his absenting himself from it for several months at a time.

Most universities are trying to remedy the defect mentioned in reason one by introducing more economics and kindred subjects in their courses, and I believe that if these three objections could be properly met, the country would benefit by having the services of more engineers in parliament.

Yours truly,
L. M. Arkley,
Professor of Mechanical Engineering,
Queen's University.

* * *

Editor, Contract Record:

Please accept my thanks for your letter of the 20th ultimo, and for the opportunity given me to express my opinion with regard to the questions you enumerate which are as follows:

1. Should engineers enter public life?

Yes, the engineer is a practical idealist and his trained imagination is directed to the service of the community. He is patriotic.

2. Why should they?

Engineers have put facts where guess-work once sufficed.

They have earned a position of influence, and stand for betterment of ethical and moral principles.

They have changed the wasteful methods of the past by scientific thought, practically applied, and within our memory.

To the engineer belongs the present, and the future depends upon him.

3. Why don't they?

The reasons present some difficulties in defining, as they are many and varied, but in general are:—

That he is but human, and is both shy and reserved though possessing dignity.

That he is unwilling to waste his time quibbling and arguing over "terminological inexactitudes" with those unwilling or unable to follow his exact reasoning.

That he will not participate in political "auction" campaigns where the favour of the majority will go to the highest bidder, in promises which are so often made upon economically unsound premises.

That he is not yet financially able to participate. His reward for services rendered are inadequate. The debt owed him by the mass of humanity is still unacknowledged.

But, the engineer is here, he has fought and is fighting heroically in aid of humanity, he is trained to think broadly and he is willing to serve, he recognises his duty to his fellow-men and appreciates his power. If he is invited to give his aid in any manner, he will respond.

Yours truly,
H. M. Bigwood,
Chairman,
Victoria Branch, Engineering
Institute of Canada.

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*These letters were received too late to be included among those incorporated in the lengthy article on this subject in last week's issue.

Will Canada Suffer a Check to Building?

Will the Experience Through Which the United States is Now Passing Fall to Our Lot?—Restriction, Premeditated and Enforced, is the Price of High Costs

High labor and building material costs have brought about a severe check to building activities in the United States, according to reports emanating from several sources. This collapse of the building boom was not unexpected; indeed, economists and others freely predicted a severe reaction to any continued price boosting. From sections of the public the threat of another "buyer's strike" was held out in an effort to curb the skyrocketing of prices and even contractors' organizations like the Associated General Contractors of America made strong appeals to the industry to keep prices within reasonable bounds in order to avoid a crash. The advice not having been heeded, the anticipated strike has materialized, with the result that all over the United States hundreds of millions of dollars of work is tied up awaiting lower material and labor costs. In New York City alone, according to the Associated General Contractors, $100,000,000 worth of construction is suspended for that reason.

Will Canada experience a similar collapse? That is a question in which all contractors are vitally interested. At the present time this country is in the midst of a building boom which, while perhaps not as intensive as the one in the United States, is nevertheless a very important factor in our general prosperity. Any cessation of the present activities will undoubtedly be serious and it will, therefore, be of interest to know what has developed on the other side, for our warning if for nothing else.

Curtailment Urged by Construction Council

The suspension of building operations in the United States was not unpremeditated. As a matter of fact, action along this line was taken about two weeks ago by the American Construction Council which held a meeting in New York of men representing banking, realty, construction, building materials and building labor. After discussion they agreed in urging "a nation-wide suspension until early fall of all new building construction save that under way and that of an emergency character." The meeting passed the following recommendations:

> That banking interests curtail the financing of speculative building until after the close of the summer.
>
> That wide publicity be given to the increasing trend of construction costs, both in labor and materials.
>
> That governmental, municipal, state, county and town construction departments be urged to delay their work as much as possible until September or October.
>
> That the co-operation of the newspapers and trade publications be sought to keep the public informed of the monthly increases in construction costs, and that they be requested to exercise their influence in curbing the demand for construction until the early months of fall.

In explanation of this restrictive program General R. C. Marshall, Jr., general manager of the Associated General Contractors of America, has issued the following statement which affords an interesting commentary on the whole building situation as it has developed in the United States:

Menaced by Dangerous Inflation

"Considering the purchasing power of the dollar today, as compared with 1913, building costs are not now prohibitive, but we are menaced by dangerous inflation. According to our index figures the cost of building in the spring of 1920 was about 55 points higher than it is now, (1913 taken as 100; 1920 was 255 and 1923 is 200) and building material prices were about 90 points higher—index figures on a 1913 base of 100 being 300 for 1920 and 210 for 1923. While building trade wages are at the moment about 75 points higher than in 1913, they are not quite so high as they were in the latter part of 1920 and first part of 1921, but as labor efficiency falls off with increasing wage rates, labor production costs are rapidly mounting. The trend is unmistakably toward heavy increase in the total of building costs. The building permits issued in 200 cities in March amounted to $397,000,000, an increase of about 50 per cent. over March 1922, and the volume of building now in progress dwarfs any previous records in the history of the country, being almost 75 per cent. greater than at any other time.

"We are undertaking this enormous expansion of building with a stationary if not shrinking labor supply, on account of the immigration restriction law, and with the material industries of the country practically at the limit of their productive capacity. There can be only one outcome of such a situation if it is allowed to persist. The cost of materials and labor will presently rise to prohibitive levels, and our enormous construction program will collapse with a crash. If history is a good guide, it will take two or three years to recover, in spite of the fact that we are still at least a year's normal building behind the housing requirements of the country.

"It is commonplace to say that all industry is vitally related to construction. If this industry tumbles from an extraordinary peak of activity to a depth of extraordinary depression, the general results will be reflected in all the country's industry and commerce.

Stabilizing Building Costs

"To us who are so situated as to see the hand writing on the wall, there was no other choice than to attempt consciously to check the rise in building costs before they become prohibitive and destructive. We calculate that if all building projects for speculative selling can be deferred for a few months, and also all other large construction projects that are not of an emergency nature, we shall effect something of an equilibrium between supply and demand in the construction industry, and will be able to stabilize costs at present or, possibly, slightly lower levels. If we do this we think that about 18 months of exceptional prosperity can be counted on in the construction trades, and that from then on the building industry will be able to gradually and comfortably meet the new construction needs of the country. As we see it, the question simply is: Will the country 'go easy' on new building for two or three months and thereby insure itself a year and a half or more of exceptionally good business, without a terminal explosion resulting in widespread ruin and distress; or will it insist on plunging into a mad carnival of rising costs and supernormal building volume which is sure to blow up in a few months and to be followed by two or three years of ruinous prostration?

"This attempt to prevent a giddy cost peak from which there will be no way down but by a suicidal leap, is something new in what you might call applied economics. It may not succeed and there may be untoward developments, but we are convinced that nothing that may come from this conscious effort to prevent disaster will be as bad as the disaster itself. Doubtless the restrictive policy may work hardship on many industrial plants and some workers, but of course in a general program of this kind, it is impossible to do individual justice to thousands and tens of thousands of cases involved. We can only hope to attain the general good, and that present individual sacrifices will be more than offset in the compensating benefits that will ensue. So far the appeal for the deferment of construction, wherever possible, has been generally responded to. Hundreds of millions of dollars of projects have been held up and the present prospect is bright that we shall be able to flatten out the ominous impending peak."

Automatic 'Phones Mean New Buildings

The Bell Telephone Co. of Canada is Erecting Several Exchanges to Take Care of the Improved Equipment—Half Million Dollar Structure in Montreal is the Latest

Just when telephone architects had reached that stage where they could recite the specifications for a telephone building by heart, along came the automatic telephones. Designing telephone buildings had almost become so perfect that the finished job was a building with less waste space than may be found on a modern Atlantic liner, and yet with almost as many refinements.

The philosophic calm of the architect was somewhat disturbed with the request for a building which would be, not alone fire-proof in the accepted sense, but dust-proof and humidity-proof. Rather a tall order, but the Bell Telephone Company of Canada have three buildings under way which, when completed, will measure up, as far as the ingenuity of architects and contractors can make them, to the standard required for the new type of equipment.

Two of these buildings are being erected in Toronto and one in Montreal. The Toronto buildings are the "Grover" building, located on Main Street near Kingston Road, built to serve a residential section and accordingly smaller than the downtown Sheppard Street building which adjoins the present Adelaide exchange and which when completed will house six complete automatic units.

The Montreal building will be located on the corner of St. Urbain and Ontario Streets adjacent to the present Plateau exchange. Demolition of the buildings now occupying the site is under way, contracts for this work together with concrete piling, excavation and other foundation work being awarded to E. G. M. Cape and Company. The Dominion Bridge Company's tender for the structural steel has been accepted. The cost of these two items is estimated at approximately $200,000.

Heavy Type of Construction

As may be seen from the illustration, the new St. Urbain Street building, while harmonizing in outward detail with the Plateau building which it adjoins, will be not only larger but of much heavier construction.

The new building will occupy a frontage of 145 feet on St. Urbain Street where the main entrance will be located, and 128 feet on Ontario Street where the entrance to the Plateau building is located.

While the building will be the full legal height, it will only have nine storeys and a basement, the extra height of ceiling required to house automatic equipment reducing the number of storeys possible within the limit of construction by-laws.

The outside walls built on a steel structure will be of La Prairie plastic brick trimmed with buff Ohio sandstone lined with terra cotta and with floor construction of reinforced concrete carried on steel beams and girders and finished in cement terrazzo or marble. The building will be as thoroughly fire-resisting as possible.

Extensions which are to be made to the Plateau Exchange, Montreal

The extra heavy floor construction is to take care of the weight of automatic equipment which imposes a live load varying from 150 to 400 lbs. to the square foot, or practically double the load carried where the present type of equipment is installed.

The elimination of partitions except where these enclose stairways, elevator shafts or lavatories when they will be of terra cotta with steel or metal clad doors, will also be a fire-resisting feature.

The window frames will be of hollow metal with wired glass. In fact, wooden trim will practically not be used; but in the few places where wood is unavoidable chestnut will be used.

The main stairway of iron and slate will be continuous from basement to roof, while the elevator will be of electric gearless traction type, equipped with wide two speed doors and capable of carrying 18 to 20 passengers at one time.

The heating system will be low pressure steam, and special equipment is being experimented with to find the most satisfactory method of automatic regulating heat when an excess of humidity is present in the atmosphere. Humidity over a certain point interferes with the satisfactory operation of the automatic mechanism, and consequently serious attention must at all times be paid to the atmosphere existing in the switch rooms.

Dust Must be Eliminated

Dust, the other enemy of successful automatic operation, also proves a problem. Experiments and observation have proved the necessity for permanent screens on all windows. The best type of material is still an open question. The finish of walls, ceilings and floors has to be considered from the point of dustlessness and the construction cracks in cement floors will be filled in with suitable material to prevent the settling of dust therein. The proverbial floor "off which you could eat" will be found in an automatic central office. Vacuum cleaners will be used to remove any dust that escapes the preventive screens. The use of a vacuum cleaner on a cement floor is an evidence of the point to which the fight against dust must be carried.

The equipment of an automatic central office almost defies description by words. A few details may give a slight impression of the magnitude and complexity of the equipment necessary.

The first "unit," or initial installation, in this Montreal building will have a capacity for 10,000 telephone stations to begin with and an ultimate capacity for 17,250 telephone stations. There will be three such units eventually having a capacity for 52,000 telephone stations.

The apparatus proper of the first unit will be located on the fourth and fifth floors, while the power plant, that is, power machines and storage batteries, will be housed on the first floor, which is large enough to accommodate the power plant for the ultimate three units. An auxiliary power plant of gas engines, etc., for emergency purposes in case of an electric power shut-off or shortage, will be located in the basement.

A unit of equipment, apart from the power plant, consists of a multitude of parts known as line switches, selectors and connectors which perform the functions of the present operator.

Some idea of the mass and intricacy of the equipment necessary may be formed if it is remembered that a girl operated exchange with a capacity to serve 10,000 stations would have about 80 operating positions, requiring 200 operators to give 24-hour service, and the mechanism provided must do this work. So, add to the equipment of a city sized central office, which no doubt most people have been through, the equipment necessary to do the thinking and work of 80 operators.

There will also be installed equipment which will complete automatically all calls coming from the ten other Montreal offices to the present Plateau exchange.

On the sixth and seventh floors there will be provided long distance equipment eventually capable of handling all the growing long distance business of Montreal.

The building, it is estimated, will cost approximately $500,000 and the initial equipment close to $2,000,000 additional, and when complete will be one of the largest and most complete telephone buildings on the continent.

Move to Make Canadian Section, A.W.W.A., a Separate District

At the meeting of the Canadian section of the American Waterworks Association at Windsor, Ont., a resolution was passed, proposing the establishment of a separate district for Canada. The association, as at present organized, comprises six districts, Canada being included as part of district No. 1.

When the resolution was brought before the convention of the whole association at Detroit for approval, it was concluded after consideration, that before this proposal could be carried out a change in the present grouping of districts would have to be made in order to preserve a proper balance. The decision, therefore, was to refer the matter to a subcommittee whose duty it will be to make a rearrangement, dividing the association into nine districts, of which Canada will form one. In this way a proper balance between the various districts will be preserved, whereas if Canada were organized as district No. 7 leaving the other districts unchanged, there would be a great disparity in the size of the new district.

The rearrangement involves, of course, a change in the constitution, which cannot be finally approved before the next annual meeting. In the meantime, the committee will work it out and a letter vote will be taken next October.

Ten Storage Dams to be Built in Quebec

It is announced that ten dams are to be erected to store the waters in connection with the power scheme of the Quebec Development Company. These are as follows:

One at Portage des Roches, across the Chicoutimi River, in Laterriere township; four dams at Pibrac, across Au Sable River; one dam at Monocouche Bay, located in Laterriere township; two dams at Creek Outlet; one dam at Coulee Gagnon, in Jonquiere township, and one at the Grand Coulee, on the Kaskania River.

Armco Culverts

"A Talk with a Highway Engineer" is the title of a new booklet issued by the Canada Ingot Iron Company, Ltd., Guelph, Ont., giving in dialogue form the merits of Armco culverts.

Chateau Frontenac, Quebec City, Nearing Completion

The additions to the Chateau Frontenac in Quebec City are now nearing completion and, consequently, it will be of interest to refer again to this job which was not only one of notable size, but also involved many unique construction features. The work comprised the building of several wings to the old Chateau. These are known as the Vercheres Wing, the Convention Hall and the Service Wing. The Vercheres wing immediately adjoins the existing building on the St. Louis Street side and consists of ten stories and basement. The convention hall also faces on St. Louis St. and comprises four stories and basement, while the service wing faces on des Carrieres St., this street having been constructed under this contract between St. Louis and Mont Carmel Streets. The service wing, which has only two full stories above the basement, connects the convention hall with the old Mont Carmel wing and completes what is practically a hollow square, with the main side of the tower wing, and the court in the centre. The tower wing is twenty stories in height, with the ridge of the roof two hundred and fifty feet above the level of St. Louis St.

The style of the building conforms throughout with that of the present Chateau and from the contractor's point of view presented one of the most difficult types to be met with, owing to the irregularities in both lines and levels, and the fact that the details varied throughout the entire work.

The structure is entirely modern and up-to-date and of fireproof construction in all details, having a structural steel frame with concrete floor slabs and stone and brick walls. The foundation is on solid rock.

The roofing on this job was an interesting phase of the construction work. It has a base hy-rib metal lathing. This was secured to the jack rafters by means of a small metal clip which was clamped on the flange of the beam and extended up into the rib of the metal lath, a four inch nail being then driven through the rib and a hole in the clamp. This when buried in the cement composition secured the whole thoroughly. The roof fireproofing was composed of four cubic feet of fine screened sand to one bag of asbestos (about 50 lbs.) and one bag of cement. This was laid on to a depth of two inches on the top and three quarters of an inch on the underside of the hy-rib. As this composition had to be laid with the consistency of mortar, it was not handled in the same manner as the concrete, but the materials were conveyed to the upper floors and there mixed by hand. To lay this, screeds were ripped from 1 1/8 inch material and securely wired on the hy-rib, the mixture then being laid on, smoothed with a zinc covered straight edge and slightly trowelled. The laying of the composition was started from the ridge and worked downward, the screeds being removed as the work progressed. When it had become sufficiently set, which usually occurred in about twelve hours, nailing strips of 2 x 3 were laid at 30 inch centres and bolted through with 3/8 inch bolts. On these nailing strips the 1¼ inch T & G sheathing was laid and securely nailed, and finally the ready roofing and copper were placed.

For the carrying out of the roofing contract McFarlane-Douglas Co., Ltd., 50 Slater St., Ottawa, were responsible. They also supplied metal covered doors, hollow metal doors, steel doors, frames and ventilating systems.

The Chateau Frontenac with its new additions

Should Re-pumping or Higher Pressures be Used for Fire Protection?

A Study of the Relation of the Fire and Water Departments to Each Other and to the Community—About 80 per cent of Water Plants Do Not Increase Their Pressures for Fires

By J. ARTHUR JENSEN
Superintendent, Waterworks Department, Minneapolis, Minn.

Before the Canadian Section, A.W.W.A., at Windsor, Ontario

A discussion of the relation of a water supply plant to fire protection serves to bring to light various phases of the subject showing the obligations of this utility to the community and some of the economic problems and difficulties involved in the operation of the plant.

Municipalities of any considerable size depend upon both water and fire departments for protection against fire losses. They are interdependent in their obligations but they are by no means the only agencies to be relied upon for this protection. Another important factor is that of fire protection and fire prevention.

There may be a difference of viewpoint between the fire chief and the water superintendent in these matters because of the variation in the nature of the services rendered by their respective departments. It is the purpose of these remarks to point out some of the conditions met with in the matter of auxiliary pressures in a water system as compared with pressures raised by the use of fire apparatus. These remarks are set forth from the standpoint of the water works superintendent.

Duty of the Water Department

A water works system is installed for the purpose of providing water supplies for the following purposes:

A. 1. Domestic supply.
  2. Sanitary use.
  3. Industrial purposes.
  4. Public use.
B. 1. Fire protection.

The reason for placing the use of water under two headings is due to the fact that the supplies may be furnished under different conditions of pressure and quantity. For group A the water may be supplied by gravity, by semi-direct pumping, by pumping to a reservoir and from thence by gravity or by direct pumping. If the water is purified it may complicate any of the gravity and pumping features by reason of the necessity of separation of raw and filtered water. For group B the water may be supplied by any of the above methods augmented by increased pressures in certain cases. Only where direct or semi-direct pumping is employed is it very practicable to secure increased pressures for fire supply.

Water works systems in nearly all cities of importance were begun three or more decades ago. The municipalities were constructed along moderate lines. The water works were designed for general use and for fire protection. Neither requirement made any unusual demand upon the water system and it was generally arranged to have the water supplied at pressures suitable for ordinary purposes. This pressure was usually fixed at an economical minimum because any unnecessary head would have to be borne at an expenditure of additional power unless the municipality was fortunate enough to have a gravity supply of ample pressure. The pipe systems were constructed to correspond to the requirements of strength and services installed of like capacity.

As the cities grew a gradual change took place in the nature of the structures erected therein. The skyscraper arrived and plants of extensive proportions grew up making additional demands upon the water supply systems and more particularly upon fire protection facilities.

Water supply development kept pace with municipal growth but ordinarily few changes have been made in the matter of changes of pressure for either ordinary use or for fire purposes. The reasons for this are due to the nature and mode of supply which present physical conditions not adaptable to the applications of changes of pressures as well as the strength of the pipe system.

Types of Plants

In the statistics of cities for 1915, issued by the Department of Commerce, data is given covering 155 water supplies of principal cities in the United States. The tables for sources of supply and modes of distribution show the following facts:

Modes of distribution	Per cent of total
Gravity or practically all gravity	13
Pumping with impounding and distributing reservoirs	12
Pumping with standpipes and tanks	22
	47
Direct or semi-direct pumping	53
Total	100

This proportion is applicable, generally speaking, to all water supplies. It may be assumed that about 53 per cent of water supplies are distributed by more or less direct pumping and that 47 per cent have some form of reservoir in the distribution system.

The presence of reservoirs, tanks and standpipes in the gridiron indicate the practice of maintaining constant pressures in the distribution of water. The application of higher pressures is not possible without closing off reservoir structures during the time required. The above data shows that such procedure is not possible in 47 per cent of the water plants without more or less complication. In the 53 per cent of supplies having direct pumping increased pressures are possible, provided that the pumps, mains and other water carrying structures will permit.

Decrease in Practice of Raising Pressure

It has already been pointed out that the demands for fire fighting are such that the ordinary increase of pressure possible and allowable in a water plant is insufficient for the requirements of to-day. Pumping plants are not, as a rule, adapted to carry increased pressures. Centrifugal pumps operating at constant speeds at given pressures and at the highest point on the efficiency curve fall off in both capacity and efficiency under higher pressure conditions. The attendant grave danger and risk of damage to pumps, mains, services, plumbing and other structures, as well as the cost and inadequacy of such service, has brought about a decrease in the practice of raising the pressures in water systems for fire protection.

This statement is borne out by a report covering 143 cities in the United States having a population of 50,000 and over in 1920, by Charles R. Henderson, manager of the Davenport Water Works. It is shown in this report that only 26 per cent of the cities listed indicate that it is possible to increase their pressure for fires. Most of the increases are made in the smaller plants. Some of the changes of pressure are made only on special request or for very important fires. In some cases the increases range only from 4 to 15 pounds which is of no material benefit. The average increase of all the cities is only 24 pounds.

In the report notations are made that certain cities are giving up the practice or that increases are possible if required, indicating that in those cities the increases are not being made. By eliminating these, it is found that only 18 per cent of these cities are actually making a practice of raising pressures in the water system upon fire alarms.

It is quite clear that water plants are not suited for actual fire fighting and that it is not common practice to raise pressures for the purpose. It also appears that where pressures are raised they are still lower than that required for effective fire fighting in important cases. A large investment has been made in water plants for pumps, large mains and hydrants for delivery of water for fire use. In the application of the means at hand the duty that falls upon the water superintendent, under the circumstances, is to furnish an ample supply of water at sufficient hydrant outlets for fire purposes, but it is not incumbent upon the department to put the water on the fire.

Duty of Fire Department

Fire departments were instituted for the purposes of protection of life and property against fire. Water was the first weapon of a fire department. Hence, the strong reliance upon the water system as its chief auxiliary. But now other means are also employed to combat the flames. More speed, extinguishers and chemicals play an important part in this work.

Rapid developments have been made in fire fighting units and their equipment. The hand pump and hand drawn hose reels have given way to more effective appliances. The horse drawn apparatus and trucks have had their day and have been outdistanced by high powered motor equipment. Fire apparatus of high efficiency can now be placed at a fire in a fraction of the time formerly required thus giving added advantage in point of time and opportunity in mastering a conflagration.

Thoroughly drilled men form highly efficient units for fire duty. They are skilled and resourceful and ready for any emergency. High buildings and extensive structures require added facilities for fire protection. These have been developed to meet the requirements. Higher water pressures are provided by powerful motor driven pumps which are an integral part of the equipment. Towers, turrets, pipes and various scaling devices are employed for high buildings.

In addition to the portable equipment there have been installed in some cities high pressure distribution systems for fire service. These are virtually powerful stationary fire engines attached to high pressure mains distributing water to high value areas. The water is applied by ordinary methods from special hydrants. These systems are prohibitive in cost except in limited districts, but they are very effective. Their general development has been retarded by these limitations and by the advancement of design of fire apparatus available for service in all parts of the city.

The well trained personnel of a fire department and the advanced development of apparatus indicate that this branch of public service is properly equipped to protect the community against fire losses and that the burden of action at the fire front is the duty that falls upon it.

Fire Protection and Fire Prevention

There is another phase of this subject that is as important as the water works plant and the fire department. An ounce of fire prevention is worth a ton of cure in the way of later effort on the part of the fire and water departments. Fire protection and prevention is the effort that can be made to take a part of the burden off from both departments.

The principal remedies offered under this head consist of the effective use of construction materials of fireproof qualities, the absence of permanent combustible fixtures so far as practicable and the adequate employment of automatic sprinkler systems. To these may be added such auxiliaries as automatic alarms, extinguishers, hose reels and nozzles. The human agencies that may be employed are watchmen, inspection of premises and disciplining of tenants.

The hydrant brings the water to the curb but ordinarily it must be applied from that point by human agencies. By the sprinkler system the water is carried into the structure requiring only a critical temperature for its application. It forms a trap for the incipient fire and is very effective in the prevention of monetary losses.

In a report of the National Fire Protection Association covering 14 years and embracing 11,257 fires in premises protected by sprinkler systems the following interesting facts are shown:

Manner of terminating fire	Number	Per cent
Extinguished by sprinklers	7,181	63.8
Held in check by sprinklers	3,514	31.2
Unsatisfactory	562	5.0
Total	11,257	100.0

The five per cent of unsatisfactory cases are tabulated in detail and it is shown that they were due to such causes as water being shut off, crippled by explosion, freezing, obsolete equipment, shut down for repairs and like interference. The lesson is clear, however, and the importance of sprinklers is admitted. The use of fire proof materials of construction is of similar importance but there is no data available for numerical tabulation showing the reduction of possible fires.

These remarks are introduced to show the importance of the means that should be employed to avoid falling back upon the water and fire departments as the last lines of defense.

Cost of Increased Pressures

Apparently there is no data available whereby it is possible to compare the cost of fire engine pumping with the cost of increasing pressures in the water system due to the fact that the latter costs are concealed in the general expense of the pumping and distribution plant. Ignoring any niceties a basis can be made upon which certain costs may be constructed to illustrate the economics involved and will be offered for what they may be worth.

The frequency for the necessity of higher pressures is indicated by figures compiled in New York City by Freitag for the year 1908. They are as follows:

Total number of fires	8,642	
Extinguished, no engine used	5,258	60.8%
Extinguished, one engine used	2,657	30.7%
Extinguished, two engines used	562	6.5%
Extinguished, three or more engines and high pressure system used	165	1.9%

The number of fires covered in this table is sufficient to make the figures significant. In scarcely two per cent of the fires were more than two engines or the high pressure fire system used or needed.

If this ratio is applied to smaller cities it appears that the importance of increased pressures is equivalent in numerical value to about two per cent of the number of fires.

The amount of water used by New York City in that year for fires is reported as 191,791,000 gallons or less than one day's average consumption. This ratio will also apply to most large cities.

In view of these facts it is a simple matter to show approximately how much water must be pumped by fire engine pumps per year in any of the larger cities. The relative costs of re-pumping this water must be compared with the cost of maintaining increased pressures by the water works pumping station during the hours required.

As a basis for this comparison the data is made up for a city having a population of 400,000 people. The distribution system is constructed of pipe which is equivalent to Class B and the pressure averages about 70 pounds.

It is assumed that it is desirable to raise the pressure for fire protection. To be at all effective such increased pressure should be at least 50 pounds. This would require Class C pipe which would permit a pressure of 130 pounds. In this case such a situation would allow an increased pressure of 60 pounds.

In order to make a distribution system adequate for this pressure it should be constructed of Class C pipe. An analysis shows that the additional weights of pipe would increase the cost of the distribution system 4.45 per cent. Valves and specials are considered ample for the additional load. Services probably would require an additional charge of from $5 to $10 but as most services are the property of private parties the item will be omitted for conservative reasons only. The increased cost of pumping machinery will probably be not less than 10 per cent.

It is found that on the above items alone the additional investment necessary to properly permit increased pressures as a regular safe practice in this case is $412,000. The fixed charges including depreciation may safely be placed at 6 per cent. This will represent an annual charge of $24,720.

The number of fires over one hour in duration in 1922 was 259 and the number of fires of over two hours duration was 79. Average duration of these fires was 3.7 hours. In this discussion it is reasonably assumed that additional pressure would be supplied at the above 79 fires. It is also assumed that the total amount of water used for fire purposes for the year was 30,000,000 gallons.

The summarized data is given as follows:

Number of fires requiring additional pressures	79
Total hours of increased pressure	292
Equivalent days	12.16
Average daily consumption, million gallons	40
Total million gallons pumped against increased pressure	486
Average cost of power per m. g. per foot	$0.0340
Increased pressure, pounds	60
Equivalent head in feet	138
Total pressure in pounds	130
Cost of power for pumping against 138 additional feet per million gallons	$4.69
Cost of pumping 486 m. g. against 138 additional feet of head	$2,279.34
Annual fixed charges, 6%	$24,720.00
Number of million gallone applied to fires	30
Cost for pumping per m.g. of applied water	$75.97
Cost for fixed charges per m.g. of applied water	$824.00
Total cost per m.g. for pumping high pressure water into distribution system	$899.97

The cost of repumping by motor pumps of fire apparatus against a similar pressure may be approximated in a similar manner. Using 1,000 gallons per minute as the capacity of the pumpers, the number of pump-hours for 30,000,000 gallons would be 500.

The data is as follows:

Number of gallons of gasoline per hour	12
Total pressure pumped against, pounds	131
Oil, waste, etc.	$ .50
Cost of gasoline	$3.00
Total cost of power to pump 30 m.g.	$1,750.00
Number of pumps considered for maximum demand, equivalent of present capacity	10
Cost of 10 pumpers	$130,000.00
Total annual charges at 10%	$ 13,000.00
Cost per m.g. pumping expense	$ 58.33
Cost per m.g. annual charges	$433.33
Total cost per m.g. supplied by pumpers	$491.66

The items of maintenance and repairs have not been included, but in the water plant they certainly would be greater than the amounts needed for the upkeep of fire apparatus whose action in hours per year in actual pumping is not very great. It appears that the actual cost of pumping in the water plant is nearly 30 per cent. greater than in the case of motor pumps and the total cost nearly double when the investment is considered. The items used in these computations are unsatisfactory from the standpoint of exactness but they serve to shed some light upon the subject which may lead to further discussion.

In conclusion, it may be said that re-pumping by motor pumpers is more economical when adequate pressures are considered than increased pressures in the water system. Fire apparatus is more flexible, mobile and efficient for fire fighting than ordinary hydrant pressures. Its use obviates the risk of applying additional pressures to water mains, services and plumbing at critical hours.

Statistics indicate that about 80 per cent. of water plants do not increase their pressures for fires and that the departments do not depend upon water systems for such pressures but develop their own pressures either by motor pumps, separate high pressure systems or both.

It is apparent that with greater use of fire proof

(Continued on page 568)

A Canadian Road Builder's Impressions of Highway Construction in England

Admires the System of Maintenance Used in the Old Land —Macadam Roads no Longer Employed—Traffic is Heavy but Roads Stand up

By W. HICKLIN*

What impresses one most at first in England is the high state of efficiency to which the patrol system and maintenance has been brought and how they take care of the enormous capital that has been expended from time to time on the roads that connect not only the large centres of population but the small villages even. This care is not only exercised in the case of the higher types of roadway but even in the old type of macadam roads "darning" is done frequently and trouble is taken to use one stitch to save nine.

Mr. W. Hicklin

Macadam

In many parts of England the building of macadam roads was given up ten years ago as they were considered a most unprofitable investment entailing frequent repairs, very dusty, and costing an amount of money out of all proportion to their efficiency as a highway for transportation, even of the lighter class. Our Canadian engineers are beginning to realize this now and no more waterbound macadam roads will be built except where the traffic is of the lightest description and even then a coating of tar is essential to preserve the surface.

Sub-grade

A great deal of trouble seems to be taken with the sub grade on which the road is built, much more than is the case on this side of the ocean. The drainage is particularly attended to and where ground is somewhat wet or damp during construction cinders are used. Like everything else over in England no detail is left to chance and highways are not built for a few years but for a generation.

Base Course

Where traffic is light a 6 in. base course of 4 in. stone is put down first on which is placed the top or wearing course; the former is filled and thoroughly rolled. In the case of heavy traffic a layer of large stones or pitching is put down first on which is laid the 6 in. course of 4 in. stone. This pitching is what we know here as one man stone and is all hand set. Most, if not all, the older types of English roads are built after this fashion and, while mose expensive make a foundation that is practically durable for all time. It might be observed in this connection that while we could show the people in the old land many improvements in the way of equipment and method of handling we have nothing on them in the class of construction they turn out.

Top Course

The top course in the ordinary country road is usually a 4 in. layer of 2 in. stone with a tar penetration rolled down to 3 in., the sealing coat of which is renewed from time to time as necessity requires. There are, of course, other types of top course such as asphalt on a concrete base and concrete reinforced,

Reinforced Concrete Highway from Bristol to Avonmouth but the former is the one most generally used and for the money spent seems to give the best results.

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*McConnell & Hicklin, Roadway Contractors, Toronto.

Screenings

The screenings used are if possible granite or limestone and granite mixed with as much of the latter as possible. This hard igneous material makes a very lasting surface, and it strikes the writer that it would surely be well worth the extra freight to haul some of this harder rock from a distance for the tremendous advantage it has over soft material such as we are accustomed to see used in Ontario. The cementing qualities of limestone dust as a binder are undisputed but it soon wears and gets blown away quickly.

Heavy Duty Roads

Where the traffic is very heavy, as in cities like Liverpool, square setts laid on concrete, with a cushion of sand, on a hand-set stone base seems to be the best method from the experience of road builders of long standing. Roads of this type are to be seen many years old and carrying loads much in excess of what is seen here and on which little or no repair has been done for fifty years. This seems incredible unless one realizes the time and care that has been exercised in the building of these highways generations ago.

Trucks

In the part of England that this article covers there seems to be little or no regulations as to the weight of loads hauled over the roads, but the law is very swift and severe on truck drivers who drive to the public danger and whose operations damage the road surface and foundations of buildings. Trailers are very much in evidence and the problem of handling these heavy loads is becoming increasingly difficult as the freight traffic increases so that nothing but the very highest class of road is considered in rebuilding any of the main arteries of travel.

It might be mentioned that steam trucks of the Sentinel and Foden type are in very active competition with the gasoline driven motor and seems very efficient as a means of transport where there is no difficulty in getting water en route.

Can You Afford to Disregard Overhead?

Every Builder, Big or Little, Should Give Proper Consideration to Important Bearing of Overhead on Cost and Profit—Overhead is of Various Kinds and May be Computed in Different Ways

By G. F. MEYNE

An address delivered before the Associated Building Contractors of Illinois

Aside from the actual construction of the building, the preparation of estimates is, of course, one of the most important functions in the contractors' business, although sometimes it is merely looked upon as a necessary evil. Builders who make the mistake in considering that estimating is a necessary evil overlook the fact that it is a most important factor toward making the business a success or a failure.

It is needless to say that proper listing of materials is essential. The methods used by so many builders in lump estimates is a very serious mistake, and usually ends up with a contractor going to the "great beyond" without leaving any visible means of support for his family, after a life of slavery.

Managers of bonding companies are very careful to scrutinize business methods of a contractor or building corporation before they are willing to furnish a surety bond. It is not often that the very responsible builder with a good reputation and long record of fair dealings is requested to furnish a bond. Architects, engineers, material dealers and owners usually know something about the business methods of a contractor, and, therefore, the bonding companies are usually only asked to bond the low or irresponsible bidder.

The first question the companies must have answered is something about the builder requesting the bond; whether or not he understands his business thoroughly—whether or not he is capable of preparing a correct estimate himself. They also ask about the figures of his estimator or other help, and if the buider is competent to check them and has good judgment.

In the second place, the bonding company is most anxious to know about the general reputation of the builder, his honesty in meeting his financial obligations and his reputation among those with whom he does business, such as sub-contractors and material men, and how he stands with his colleagues in the business.

Thirdly, one of the prime requisites of a builder when he requires a bond is, of course, his financial ability. Not only is his capital scrutinized, but his business efficiency and general executive ability. Needless to say, it creates a bad impression when builders appear in the office of the bonding company with their figures on the back of an envelope. Probably they have cubed a job, or, worse yet, have taken some figures that some architect or owner has told them they could get the job done for. Needless to say, the man with a good appearing sheet, his items all properly itemized, showing that the plans and specifications have been carefully surveyed, will have considerably less trouble to be bonded than the sloth.

The Importance of Overhead

The item of overhead expense is one that has long been neglected by the smaller builders, but it is an item of such considerable importance that it should have the most careful consideration of every builder, little or big. I caution and admonish, as well as counsel, advise and command, that out of every building operation undertaken you get back in money at least the actual cost of its complete production plus the overhead.

The item of profit is one which your own avariciousness demands, or the competition of colleagues permits, or your conscience will allow you to take, but you are at least entitled to all the money you put into an operation. This money, as previously stated, is the cost of labor and materials, permits, liability insurance, bonds, owners' contingency insurance, fire estimate, miscellaneous contingency, such as cutting for other trades, removing of debris, field overhead and general overhead.

I will come directly to the explanation of what I mean by field overhead and general or administrative overhead. When the estimate has been made and after the cost of the building has been totaled, a certain percentage for overhead should be allowed. This is sometimes called the cost of doing business. This percentage is calculated in various ways, but it is usually determined by each contractor according to the size of his operations and personal efforts.

Administrative Overhead

Administrative overhead or expense is that charge which cannot be directly charged to a project or job, and should be again divided into two classes; fixed office expense and miscellaneous expense. Fixed office expense consists of salaries to executives (meaning that the builder should put himself on the payroll), estimators and clerks, rents, plant depreciation, furniture and fixture depreciation, interest on equipment, cost keeping and the helpers involved therein, bookkeeping and its involved cost, yard men and tool men. Miscellaneous expense is, of course, invisible, and is usually composed of stationery, billheads, advertising, interest on borrowed money, office supplies, telephone, telegraph, postage, business travel, automobile upkeep, taxi fares, charity, business insurance, legal expense, tool and equipment maintenance, team account, etc.

Field Overhead

Field overhead, as I regard it, should also be divided into two classes—non-productive labor and its kindred expense and such invisible overhead as accrues on the job whether or no. Sometimes it cannot be avoided, no matter how much endeavor or effort the builder may put forth to stop it..

Coming back to field overhead of the first class, which we shall call the non-productive field labor overhead, this is made up of superintendents' salaries or wages for the time of timekeepers and material clerk, also the expense of equipment, rentals, setting up equipment, removing and putting equipment in good order and hauling it back to the yards, temporary offices, tool shed, cement shed, temporary power and light, temporary enclosures and fences, sidewalk protection, water connection, tarpaulins, machinery protection equipment, hauling, etc. (Offices, sheds, etc., should be considered cost.)

Invisible Overhead and Lost Time

Invisible overhead arises on a job or project, and is very often incurred by negligence, sometimes sabotage. More often the best efforts cannot prevent it and it should be taken into consideration when making up an estimate.

Lost time is the bottomless pit into which more money than can be estimated has been dumped by contractors. A day free from delays will produce twice as much as an average day. To attain the ideal production means cost keeping and system—hence overhead. Invisible overhead is usually composed of more or less the following items: Interference of inclement weather, time lost by breakdowns, time lost by shifting plants, time lost waiting for other parts of the project to be made ready, time lost waiting for material, time lost by shifting men to other jobs, efficiency lost by putting on new men, crews too small to be effective in relation to superintendents, foremen, etc. This last item was the case with a certain bricklaying and plastering situation last summer. The builder often had his foreman working with two or three bricklayers and as many laborers. Could he have obtained 20 bricklayers, his overhead would have been the same per diem. The importance of including this invisible expense in the estimate as a contingency of overhead is readily apparent.

Making Up of Overhead

The making up of overhead is, of course, not alike in every office, but if the gross expense for the year, including the contractor's own salary, is $15,000 and the business amounts to $300,000 per year, evidently the overhead is 5 per cent. There are a number of books of more or less value written on the subject of "Cost Keeping Systems" for construction work. Nevertheless, the builder neglects the opportunity of familiarizing himself with and studying the systems offered, and will continue his lamentations over unfair competition and his complaints about the contracting business being the worst business on the earth to use up men and money. In travelling last year, I had many talks with former contractors and realized that they were very quick to criticise and damn their colleagues in the same town and nearby towns, but that they had little understandings of the real system of the business. They, as a rule, had been excellent mechanics and sometimes foremen, and had been content to let their laurels rest on these achievements. I also found contractors unwilling to sit down and talk over operations and costs with their competitors, and to generally organize for their own good.

What System Is

Taking the first step in system is to map out the object desired and also to map out the results to be obtained and preferably always on paper. It is astonishing what cold figures, on paper, will analyse after a job has been completed. System includes the keeping of records and costs, such as bookkeeping, filing system and estimating. The contractor sometimes objects to a system and calls it red tape, but, somehow or other, the operators who have surrounded themselves with some red tape do not seem to make assignments in bankruptcy as often as the man who will have none of it. The small contractor objects to system because it takes up so much of his time. If the small contractor's business has grown to such an extent that he must work more than ten hours to keep abreast with his work, then it is absolutely necessary for him to acquire some help, so that he may keep his business records correct as to the income and the outgo of money, the records of his banking accounts, the condition of his equipment and tools, etc. He then at once acquires overhead in addition to his own salary. As to what a builder's salary should be, his competitor, his conscience and his avariciousness will have to be his guide.

Sub-Contractors' Overhead

We have been discussing the overhead of the general contractor, usually known as the carpenter or mason contractor. His overhead is, of course, considerably less than the overhead of, for example, the plumbing contractor or the painting contractor. The average overhead of the painting contractor is approximately 20 per cent., consisting of the usual fixed expenses and miscellaneous expenses, use and depreciation of brushes, paint pots, step ladders, drop cloths, jack ladders, small cloths, auto trucks, etc.

It has been found that 22½ per cent. is an average overhead for the plumber and it ranges from 18 to 20 per cent. in small establishments where the proprietor puts in his time in the evening, making out calculations, bills, rent, use of tools, etc.

Just one word about cost keeping and bookkeeping. The psychology of having a cost keeping system tends to bring out efficiency in one's crews, and, if employed for no other reason, would pay for itself on each job, whether cost-plus or straight contract. An owner who objects to paying for a cost-keeping system, having a cost-plus job, is cheating himself, and is very apt to have surprises before the job is done, and, quite often, an existing friendship is broken up by ugly charges.

I would like to caution contractors to constantly urge their bookkeepers to have their bills ready and get their accounts rendered, and insist upon payments. The man who has his accounts up to the minute and is up on his collections seldom has to go to court or employ the mechanics' lien law. Red tape has saved him a loss on cost-plus work. Where it is known that the contractor has a real system or an overhead which shows up every item of cost on the project, he will have no trouble with his statements, and 90 per cent. of the time Mr. Owner will never send in an auditor. Again I caution you that the cost of the building is made up of its labor, material, its various contingencies, and overhead.

Machinery & Equipment

A New Size Gasoline Shovel

A one yard capacity shovel operated either by gas or electricity, has been brought out by the Pawling & Harnischfeger Company of Milwaukee, Wisconsin. The new machine is very similar in design to the P & H ½ and ¾ yard machines.

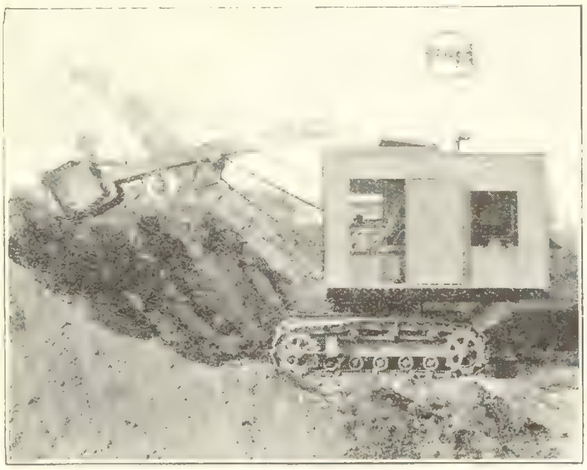
Being driven by gasoline or electric motor the machine is operated by one man, no foreman being required. The saving of this one man's wages alone amounts to a great deal of money. Another excellent feature of the gasoline or electric drive is the practical elimination of fuel and water hauling expense. This item is very costly with the steam machine often requiring the full time of a man and team. Another advantage of the P & H is the ease of operation in inaccessible places. As a matter of fact the P & H can operate at places where it would be impossible to operate a steam rig.

The crowding motion of the one yard shovel is of the standard P & H design. A manganese rack on the dipper stick is driven by a heavy thimble roller chain from a set of planetary gears. These gears are mounted on the forward drum of the machine. This gives a positive crowding motion regardless of the position of the dipper and enables the operator to bite into the heaviest digging.

The machine is designed to come within standard railway clearances with only a minimum amount of dismantling. This is a very important feature for machines that have much moving to do.

The shovel is mounted on the well known P & H "Corduroy Traction," so called because it really lays its own corduroy road. The traction is very rugged being built entirely of steel and is non-clogga in the heaviest going.

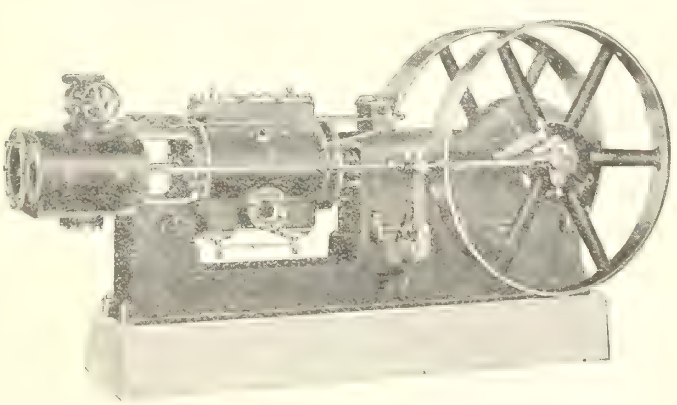
In addition to being used for a shovel, by a s change of booms, this machine is used with dragline, clam-shell, pile-driver, crane hook, etc.


The P & H 1-yard steam shovel

New Line of Canadian-Built Steam Driven Air or Gas Compressors

A new line of steam driven air or gas compressors ranging in size from 67 to 1083 cu. ft. piston displacement per minute has recently been placed on the market by the Canadian Ingersoll-Rand Company Limited, Montreal, P.Q. These machines, known as the Class "FR-1" are the steam driven companions of this company's class "ER-1" belt driven compressors and, like the latter, are of the single stage, straight line, centre crank, dust and dirt proof type with automatic lubrication of both running parts and compressing end.

They embody every refinement of modern compressor design, including a number of features which make them as nearly automatic in action as any machine of this type can be expected to be. For this reason the Class "FR-1" compressors are recommended for use in small mines, quarries, on contract jobs, in foundries, machine shops, industrial plants, etc., as well as for use as auxiliaries in large air power plants.


New Ingersoll-Rand Class "FR-1" straight-line steam driven, air or gas compressor with "wide-range" automatic cut-off governor and free air unloader

In general, the Class "FR-1" compressor consists of a plate valved compressing cylinder, direct-connected to a steam engine, with balanced piston valve and automatic cut off control, a design which makes it possible to operate with high pressure and superheated steam as well as the moderate pressures more common in the past.

The main frame, as previously mentioned, is one of the enclosed type, the bottom part of which forms a reservoir for the combined splash and flood lubrication. It is fitted with removable side and crank end covers. The crosshead guides are of the bored type and the design of the frame provides for an oil stuffing box near the cylinder end of the frame, which prevents any chance of crank case oil entering the compressing cylinder end of the main frame and in the trunk piece interposed between the steam and air cylinders provides for adjustment of all stuffing boxes when the machine is running.

The main frame and trunk piece are mounted on a substantial cast iron sub-base which lends rigidity to the entire structure, makes the machine a complete self-contained, accurately aligned unit and also forms a support for the single rocker arm which guides the valve rod. There are no guide blocks or other sliding surfaces in the piston valve gear.

The main bearings are of very heavy construction and are provided with removable die-cast shells or liners of genuine babbit metal which can easily be removed and renewed. The crank-shaft and connecting rods are solid one-piece drop forgings accurately machined and heat-treated. The crosshead is of the cylindrical type, of box construction with adjustable bored and turned shoes. Pistons are of the box type with broad faces and are securely fastened to a turned and ground steel rod.

Oil is distributed to all of the running parts by throwers on the crank webs which lift or throw the oil against baffles from which it runs to all wearing surfaces. Lubrication of steam and compressing cylinders is provided for by a double compartment, adjustable, sight feed, mechanically operated lubricator.

The piston valve is provided with two piston rings at each end and operates in a renewable bushing. With this type of valve there is no rapid wearing or cutting and the valve chest stuffing box is only subjected to exhaust pressure as steam is admitted to the centre of the valve and exhausted from the ends.

Regulation of Class "FR-1" compressors is regularly provided for by an Ingersoll-Rand "Wide Range" automatic cut-off flywheel governor and either "A-39" inlet or the new Ingersoll-Rand "Free Air Unloader."

Another feature of these machines worth attention is the ease and rapidity with which they can be converted to belt drive or used as a combined belt and steam driven unit. Due to the extent of hydraulic electric development in Canada it sometimes happens that local conditions may make it advisable to change over to motor drive or to use a combination of the two for stand-by purposes. This can be readily accomplished on these machines.

Standard Thicknesses of Lumber Recommended

Recommendations on sizes of so-called 1 in. and 2-in. lumber have been made by the Forest Products Laboratory, of Madison, Wisconsin, to the Central Committee on Lumber Standards. The recommendations are as follows and will be found interesting:—

One-Inch Boards.—It is believed that 13/16 inch is the minimum thickness which will give a reasonable degree of satisfaction for requirements of use, although an increased thickness will give greater service. It is also recognized that under best manufacturing conditions 13/16 inch is the maximum obtainable from boards cut one inch thick in the rough green condition. Furthermore, economic lumber distribution and forest conservation both demand that inch lumber when dressed be the maximum obtainable from the rough boards as sawed from the log. Therefore, 13/16 inch is recommended as the finished dry thickness for so-called one-inch boards.

Two-Inch Dimensions.—It is believed that lumber 1⅝ inches thick will satisfactorily meet the strength requirements of joist and studding, which uses govern the thickness of dimension; and that sizes in excess of 1⅝ inches are wasteful. Therefore, 1⅝ inches is recommended as the finished dry thickness for so-called "two-inch" dimension.

Widths.—It is believed that the dressed widths of one-inch lumber and two-inch dimensions should be the maximum obtainable under best manufacturing conditions. These are dressed widths of ⅜ inch scant on widths up to 7 inches and ½ inch scant on wider widths, and they should be the same nominal size for both one and two-inch lumber. Therefore these widths are recommended.

Sewage Treatment for Small Buildings

The Federal Department of Health has just issued a brochure on sanitation dealing with the subject of sewage treatment for isolated houses and small institutions where municipal sewage system is not available. The urge for such information has been so insistent and, having in mind the health and welfare of the people, it was considered advisable to have the subject dealt with in a scientific and thoroughly practical manner. The publication is generously illustrated, emphasizing the application of the advice given.

Homesteaders, summer cottagers and trustees of small institutions, are strongly advised to avail themselves of the information contained in this publication, which can be obtained free on request from the Deputy Minister, Department of Health, Ottawa.

Facts About Toronto

The 1923 edition of Municipal Hand-Book of Toronto has been issued by the city clerk. As usual it is full of carefully compiled information in condensed form about Toronto's municipal activities. For reference purposes it is a very valuable little publication.

Should Re-pumping or Higher Pressure be Used for Fire Protection Purposes

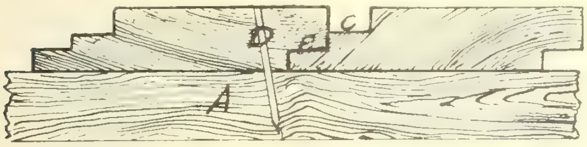
(Continued from page 563)

materials for construction, more general application of sprinkler systems and well organized fire fighting units equipped with modern appliances that water departments may function in their proper sphere, viz: to deliver water under economical and safe conditions for the general use of the community.

Hints for the Contractor

Wood Siding Imitates Brick

A new siding, made to imitate brick is now on the market. It is made from 1 x 4″ material, finished to ¾ x 3½″. Each length of siding has a ½-in. groove along its upper edge from end to end and cross grooves of the same depth at 8″ intervals. These grooves correspond to the mortar joints in brick construction. The face of the siding is not surfaced, but is rough as left by the teeth of the re-saw and when painted gives a very good imitation of a brick wall. After being nailed in place, the siding is painted, with the grooves a contrasting color so as to give the effect of a mortar joint.



Grooves in siding give the appearance of brick

The accompanying cut illustrates the method by which this siding is applied to the building. "A" is the underboard fastened to the studs; "B" shows the shiplap joint of the siding, ½″ wide; "C" is the longitudinal groove, and, "D" indicates how the boards are held in place by means of nails. This should prove a warm siding, since the possible shrinkage in 3″ could produce very little effect on the ½″ lap joints. This material is now being manufactured in Canada under a Canadian patent.

Unique Method of Lowering Steel Tank into Pit

S. H. Excell, city superintendent of Vernon, B.C., submits the accompanying illustrations to indicate how a large steel tank was placed in the bottom of a pit without the use of derricks or tackle. The tank in question was made to serve as a reservoir for fuel in connection with a small Diesel engine driven electric generating plant. It was to be placed in the bottom of a concrete well or pit several feet below ground level. To accomplish this without the use of a derrick or other lifting tackle, the concrete pit was filled with water and the steel tank simply rolled in. It naturally floated on the surface of the water which was then pumped out allowing the tank to settle to its proper location. This method proved both simple and expedient.

Small Influence of Knots on Stiffness and Strength of Timbers

The completion of the second year of a four-year test program on long timber columns, in progress at the Forest Products Laboratory at Madison, Wis., show that knots in themselves have little influence on the stiffness, and consequently on the strength, of the columns.

The test specimens were 12 in. by 12 in. by 24 ft. 0 in., ranging from light-weight knotty material to heavy clear material, in both Southern Pine and Douglas Fir. The presence of a large number of knots in a timber, however, would indicate that it came from the upper portion of the tree which normally would have a lower modulus of elasticity.

Engineers and designers place a greater importance upon the weakening effects of knots than, in the light of these tests, would be necessary or justifiable under usual conditions met with in practice.

Remedies for High Cost of Construction

Among the remedies suggested, officially and semi-officially by the Associated General Contractors of America for relieving the present high cost of construction, are the stabilizing of prices on the part of producers and of wages on the part of labor; the removal of restrictions on labor output; purchasing of such building materials only as are actually needed and the construction of fewer public works by the Federal Government.

Fuel oil tank was lowered into pit without the use of a derrick by floating it and then pumping out the water

Copper for Roof Flashings

The Architect and the Roofer Must Know the Requirements and Specify Accordingly—Definite Uses for Hard and Soft Copper

The average house builder knows little about roofing. To him the roof is that part of the building which gives him protection from the elements. He knows nothing of and has not the time or inclination to inquire into the various ailments with which a roof can be afflicted. If, the roof leaks, from whatever cause, he blames the roofing material and the builder, and frequently unjustly so.

During severe rain and wind storms a leak appears around a dormer window and the wall paper and decorations are ruined. The owner of the house blames the roof and the builder impartially, when the chances are the failure is the result of his own ignorance of the waste and futility of using anything except copper for flashings.

The same is true of larger structures—office buildings, schools, churches—in which flashings are used. Illusive leaks appear a few years after completion. Ugly spots spoil ceilings and wall decorations; often the plaster falls. The stained areas are ominous looking and unsightly.

All too often these roofing leaks are due to poor flashings. Sometimes the roofer or architect is at fault; but more often the flashing metal rusts and fails. The unfortunate owner who perhaps congratulated himself on the bargain he built or bought is obliged to spend a considerable sum to do over work for which he has already paid.

Without question all these troubles can be done away with. First, the owner must see the advantage of using copper. Second, the architect must specify the right kind of copper. Third, the roofer must apply the copper in the proper manner.

There may be differences of opinion about roofing materials, although copper is undoubtedly the cheapest and best of the permanent roofing materials. But there is complete unanimity that the best flashings are of copper. Architects, roofers and far-sighted home owners are agreed that no other material so well does the work demanded of flashings. The reasons for this well earned confidence are durability, workmanship and ultimate low cost. Copper combines these as does no other material.

Temper of Copper for Flashings and Gutters

Copper meets are made in several degrees of temper, or hardness. Experience has very definitely established the two which are best suited for flashings and for gutters and leaders. The building profession has come to know these as (1) "soft" or "hot-rolled," and (2) "hard" or "cold-rolled" copper, and it is a common practice to so designate the sheets in specifying or ordering.

It can be readily understood that because there are different degrees of temper, mistakes occur due to the confusion arising from ordering, for instance "16-oz. hard-rolled copper." The question the manufacturer asks is "how hard?", for the process of manufacture is dependent upon the results desired.

Copper sheets are made from "cakes," which after being heated to the required temperature, are passed through rolls until the desired thickness of sheet is obtained. The first part of the process is the same for all tempers. When the copper has cooled below a workable temperature, it is again heated and rolled, this procedure being carried on until the sheet is within a few gage numbers, or thicknesses, of the finished product.

If the material is to be "soft" or "hot-rolled" it is again heated and rolled to the required thickness and then given a final heat or "anneal" to remove the hardness acquired by rolling.

The hardness of sheets is determined by the reduction in thickness before re-heating. So, depending upon the temper or degree of hardness desired, the sheets are brought to certain thicknesses which will give the required final thickness with the necessary rollings; are then heated to the proper temperature and are finally rolled to the desired thickness and hardness and allowed to cool.

From the above facts it is apparent that unless the temper, or hardness, of copper is definitely specified, or the purpose for which the sheet is to be used is described, the manufacturer has not the information necessary to supply the proper material. As the result of the confused use of terms, sheet of a hardness ill-adapted to the service desired have sometimes been used with very unsatisfactory results.

There are two hardnesses of copper which are adapted to use for roofing purposes. The maunfacturer knows, from experience, what these degrees of hardness are. They are designated as "roofing temper" and "cornice temper." The former is a "soft" or "hot-rolled" product, the latter a "hard" or "cold-rolled" one.

In order to prevent misunderstanding and confusion and to make as definite as possible the kind of copper desired, it is recommended that the trade and architectural profession adopt the following terms:

Use	Instead of
Soft (Roofing Temper) abbrev. (R. T.	Soft Soft-Rolled Hot-Rolled
Hard (Cornice Temper) abbrev. (C.T.	Hard Hard-Rolled Cold-Rolled

All flashings of whatever description should be of soft (roofing temper) copper sheets. Such copper is peculiarly suitable for this use, for it is easily worked and shaped and stands up well under temperature stresses. There is no place in flashing—or counterflashing—where soft (R. T.) sheets will not serve better than hard (C. T.) copper. The latter, being comparatively hard, is more liable to fracture when bent and so does not lend itself as readily to shaping nor stands up so long under temperature stress. The softer the copper the easier it is worked and shaped, and the more readily it adjusts itself to changes caused by expansion and contraction.

Conversely, the material of all shaped gutters, eaves troughs, leaders, cornices, etc., should be hard (cornice temper) copper. Its stiffness is necessary to maintain the shape, especially against ice and snow loads. As most shapes are of mill manufacture, the process is such that the chance of fracture at the bends is minimized.

In fact, all manufacturers of gutters, leaders, etc., make them of hard (C. T.) copper, because experiment and experience have proved their practicability.

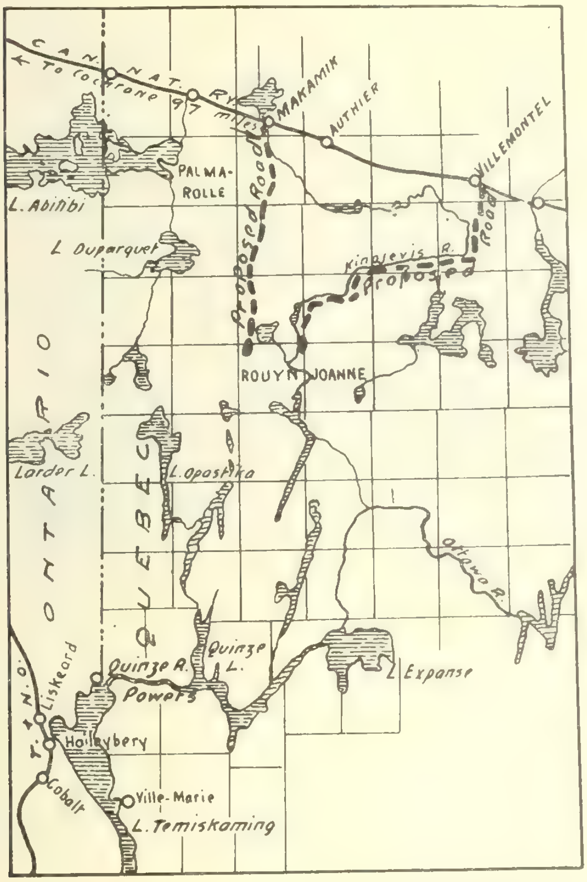
To this general rule there are two exceptions—

gutter linings and cornice ornaments. These should be of soft (R. T.) copper.

Gutter linings in gutters of any length are peculiarly subject to temperature stresses. The continual warping to which the sheets are subjected soon fatigues hard (C. T.) sheets, and cracks develop at the bends. It is reasonable to say that the use of a softer metal will overcome this cause of failure.

New Roads in Northern Quebec

In last week's issue of the Contract Record on page 140 appeared a reference to new road connections which the government of Quebec is undertaking in the northern part of the province. Unfortunately the map to which reference was made was omitted, making the description somewhat vague. It is reproduced above, however, and taken in conjunction with the text previously printed, affords an adequate explanation of the Quebec government's plans.



Road Builders' Association Plan Next Meeting

Announcement of the election of new officers and directors and decision by the new board of directors as to the time of the next convention and national good roads show were the chief features of the annual meeting of the American Road Builders' Association held in New York on May 15. Among the directors elected for a term of two years were H. S. Carpenter, deputy finister of highways, Regina, Sask. Chicago was selected as the next place of meeting and January 13 to 19, 1924 as the dates.

Eastern Canada Representatives of Osgood Co.

The Osgood Company, Marion, Ohio, manufacturers of revolving and railroad type steam shovels have announced the appointment of Lamoreux-Kelly, Ltd., 285 Beaver Hill Hall, Montreal as sales representatives for that portion of Canada east of a north and south line through Port Arthur.

National Lumber Manufacturers Settle on 25/32 and 1-5/8 Thicknesses

At the meeting of the Standardization Committee of the National Lumber Manufacturers Association, held in New Orleans, March 23, in connection with the annual meeting of the association, an agreement was reached among the representatives of all constituent associations of the National body, excepting one which was not represented when the action was taken, upon standard finished sizes of lumber as follows:

That 25/32 of an inch shall be the standard finished size, surfaced two sides, of all grades of 1-inch lumber, kiln dry basis, and 1⅝ inches as the surfaced thicknesses of small dimension.

Trade Publications

Caterpillar Tractors

The Holt Manufacturing Company, Inc., Peoria, Ill., have a booklet entitled "Caterpillar Tractor Performance," depicting by a comprehensive collection of illustrations the wide range of operations for which their tractors are suited. For construction work the Caterpillar has a high degree of usefulness and several of the pictures show the machines being used for this purpose.

Recent Work of Dwight P. Robinson Company

In an 8-page folder just issued, the Dwight P. Robinson & Co., Inc., engineers and constructors, New York City, illustrate some of the work on which they have been recenty engaged. Apartment houses, hotels, office buildings, power plants and industrial projects are among the types of construction handled by the firm.

Small Steam-Driven Compressors

The Canadian Ingersoll-Rand Company, Montreal, P.Q., have issued bulletin K-312, describing a new line of small steam driven compressors, which are produced at their Sherbrooke plant. This catalogue contains 28 pages and numerous illustrations covering these machines and should be of value to anyone interested in steam driven compressors for compressing air or commercial gases. The machines are known as "Class FR-1."

Jackhamer Drills—Bulletin 4046-C, issued by the Canadian Ingersoll-Rand Co. Ltd., Montreal, describes the construction and uses of Jackhamers of both dry and wet patterns, mounted and operated by hand.

The Contract Record's

Weekly House Suggestion No. 70

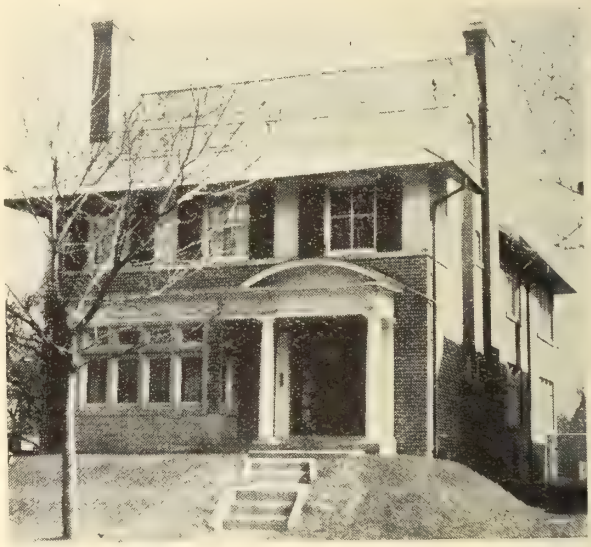
The architect, Mr. Ewart G. Wilson, of Toronto, has been successful in imparting to this week's subject, which is of the duplex type, the very desirable feature of having a single residence appearance. There is a common front entrance and hallway, but the rear entrances are separate and the general layout incorporates all the modern features of the duplex residence. This house was built recently in North Toronto.

The exterior construction is pressed brick on the first floor, with stucco on brick above, stone trim on windows and front entrance terrace and wooden shingle roof.

The halls are trimmed in oak, the dining rooms and living rooms in figured gum-wood, the sunrooms, kitchens and bedrooms in white pine, white enamelled. The walls and floors of the bathrooms are of tile. Flooring throughout the balance of the house is of 7/8" oak, which is stripped to provide an air space for deadening sound. The mantels in the living rooms are of Eatonia brick construction and in the halls, of ordinary rug brick.

The reproduced plans are so complete in construction detail that they require little explanation. The rooms are well arranged in relation with each other and the plan of entrances at the rear has been well worked out. Each floor has separate boiler room, coal and laundry space in the basement, with separate entrances thereto.

Mr. Ewart G. Wilson, Bank of Commerce Bldg., Yonge and Bloor streets, Toronto, is the designer of this well planned duplex.



FIRST FLOOR

New Hardwood Flooring Plant is Busy

Since the company began operating about two months ago the Star Flooring Co. located at 618 Brock Ave., Toronto, has not had a single idle hour. The new concern specializes exclusively in the production of carefully manufactured 3/8" oak flooring and has a complete modern flooring unit. All the machines have recently been installed and are now running at full capacity. They include an American flooring machine installed by the American Woodworking Machinery Co., of Rochester, N.Y. This planes both surfaces and tongues and grooves at a speed of 60 ft. per minute. The remaining equipment was installed by the Canada Machinery Corporation, of Galt, Ont., and comprises an end matcher, a self feed saw and two lighting cut off saws. This equipment is turning out 4,000 feet of oak flooring daily and the company is finding buyers as fast as the flooring is produced. Selling direct to the contractors, the Star Flooring Co. has a ready market for its product.

Mainly Constructional

East and West—From Coast to Coast

The concrete work of the Canadian end of the proposed new Michigan Central bridge at Niagara Falls, Ont., will be done by the Federal Construction Company, Toronto, and an advance gang of men are already on the job. The work on the American side will be done by the Gass Thurston Company, and their derricks and materials have been loaded at Detroit. The initial work on both sides of the river will be the scaling of the walls of the gorge and the taking away of all overhanging rocks and loose materials. This process will make the cliffs practically perpendicular. The cliffs will then be given a smooth finish by concrete being shot against the walls for a distance of 50 feet on each side of the bridge. A heavy timber covering will be placed over the Gorge railway to prevent danger to cars passing below the place where work will be in progress. It is expected that all concrete work will be completed by the end of the summer and the steel work next summer. Then will follow the problem of destroying and removing the present bridge which is expected to present many engineering difficulties.

The Dominion Construction Co., of Toronto, have been awarded the contract for a considerable portion of the work involved in the extension of the Michigan Central Railway's yards near St. Thomas, Ont. It is estimated that this work will cost about $500,000 and will involve the laying of new tracks in the yard, doubling the present capacity.

Mr. A. R. Williams, building contractor of St. John, N. B., reports a number of small jobs on hand but states that nothing of considerable size has come to hand as yet, though prospects for the future are bright.

Mr. A. Danby, building contractor of Hamilton, Ont., has opened a factory at 281 Main St. W., that city, for the manufacture of store fittings and general wood products. The factory is equipped with modern machinery for this purpose and Mr. Danby is planning for extension of the premises at an early date. He will continue to carry on his building business at the same time.

A recent report states that the town of Kirkland Lake, in Northern Ontario, is making plans for the installation of a water supply system. It is estimated in the report that this will cost in the neighborhood of $150,000.

There are 68 houses under construction at the present time in the town of Terrebonne, Que., which was practically wiped out by fire recently.

The Imperial Bank is to receive $1,200,000 from the C. N. R. for property expropriated at the corner of King and Yonge streets, Toronto, under the judgment of Judge Audette filed in the exchequer court recently. The bank had claimed $1,350,000 with interest. The amount awarded is without interest or costs.

Personal

Mr. H. S. Carpenter, deputy minister of highways, Regina, Sask., was elected a director of the American Road Builders' Association, at their annual meeting which was held in New York on May 15.

Mr A. R. Cobb, architect of Halifax, N. S., has been appointed to prepare plans for the construction of the town of Humbert in Newfoundland, in connection with the Humbermouth Pulp Development. This large development is being financed jointly by the Newfoundland government and an English firm. Mr. Cobb and Mr. Thos. Adams, the town planning authority, recently made a survey of the site of the proposed town.

Mr. Harry Jenkins, building contractor of Toronto, has moved from 315 Kennedy Ave. to 341 St. Clair Ave. E.

Mr. Geo. W. Craig, for the past 10 years city engineer of Calgary, Alta., has resigned to accept an appointment as district manager of the Asphalt Association in Chicago. From 1909 to 1913 Mr. Craig was chief engineer for the city of Omaha, Neb. From 1907 to 1909 he was engaged in engineering and contracting as a member of the Katz-Craig Contracting Co. Throughout his career he has been prominent in such organizations as the American Society for Municipal Improvements and the American Society for Standardizing Specifications. Mr. Craig was chairman of the original asphalt committee of the Association for Standardizing Paving Specifications and is, at present, a councillor of the Engineering Institute of Canada.

Mr. Ronald Harrison, B. A. Sc., was recently appointed engineer and superintendent of the Scarboro Water Works System, Scarboro, Ont. Mr. Harrison was formerly connected with the Toronto engineering firm of James, Proctor and Redfern for 1 year and with the Hydro-electric Power Commission of Ontario for 2 years.

Mr. F. L. Fellowes, city engineer of Vancouver, is at present visiting several points in Eastern Canada. Mr. Fellowes' trip is of the nature of a holiday, but he will also take advantage of this opportunity to study the operation of public utilities commissions in the large Eastern centres and will, more than likely, represent his city at the Good Roads convention in Hamilton.

Trade Incorporations

Welland Contracting & Excavating, Ltd., with head office at Welland, Ont., capital $40,000, to carry on the business of contractors.

Wentworth Quarries, Ltd., with head office at Hamilton, capital $200,000, to carry on a quarrying business.

Burnt River Quarries, Ltd., with head office at Toronto, capital $100,000, to operate a stone quarrying business.

Durham Stone & Sand Co. Ltd., with head office at Toronto, capital $500,000.

Pioneer Builders, Ltd., with head office at the town of Fort Frances, Ont., capital $40,000, to carry on a building and contracting business.

CONSTRUCTIONAL ACTIVITY

Period of May 30 to June 5, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Ailsa Craig, Ont.
The installation of a waterworks system for fire protection is being considered by the Town Council. A public meeting to discuss the matter may be held shortly. James Clark, clerk.

Brantford, Ont.
The City will lay 600 ft. of 12 in. pipe, storm sewers on Clarence St. by day labor. S. F. Leonard, secretary.

Chatham, Ont.
Drainage work and new culverts are contemplated by Howard Township. G. A. McCubbin, 135 King St., Chatham, engineer.

Fullarton, Ont.
R. H. Pomeroy, clerk of Fullarton & Hibbert Townships, will receive tenders for the construction of Mahaffy drain, until June 11.

Hamilton, Ont.
Paving of Aberdeen Ave., is contemplated by the City and Barton Township. S. H. Kent, City Clerk.

Sewers on McKinstry and Burlington Sts., are contemplated by the City Council. W. L. McFaul, engineer.

Widening Ferguson Ave., from King St. to Jackson St., is being discussed by the City. S. H. Kent clerk.

The City contemplate pipe sewers on Stapleton Ave.; Burlington St. to Beach; Tragina Ave., from Barton to Main St. Trunk sewers may be laid in the Westdale survey on Sterling St.

Watermains are contemplated by the City for the following streets: Beachwood Ave.—Melrose to Leinster St.; Benson St.—Gertrude south to existing main; McKinstry St.—Burlington St. south 350 ft.; Dalewood cres,—King to Paisley St.; North Oval,—King to Sterling St.; Cline St.—King to Paisley St.; Dromore Cres.—King to Paisley St.; Haddon Cres.—King to Paisley St.; Whitton Rd.—King to Sterling St.; Rose Ave.—Gage to Avondale Ave.

Montreal, Que.
Tenders for the installation of a 6,000,000 gallon pumping unit for the Notre Dame Des Gres Pumping Station, will be received by the City Clerk, until June 11. Specifications are at the office of the Montreal Water Board, 19 Atwater Ave.

New Toronto, Ont.
Tenders will be received until June 9 by the Public Utilities Commission for approximately 1,100 ft. of 30 in. steel pipe and a number of 30 in. flexible joints and special fittings. A. H. R. Thomas, engineer.

The Public Utilities Commission will receive tenders until June 16 for the construction of an extension to the intake pipe.

Owen Sound, Ont.
Tenders for the construction of approximately 5,000 lineal feet of 42 in. to 12 in. sewers will be received by City Engineer, D. H. Fleming, until June 14.

Regina, Sask.
Tenders for the constructon of the following roads will be received by the Provincial Department of Highways, until June 13: Abby to Lancaster; Southfolk to Eastend; west from Kronau; plans and specifications may be seen at the Department of Highways.

St. Catharines, Ont.
Grantham township clerk, L. S. Bessey, St. Catharines, will receive tenders for supplyng and laying of 3,520 ft. of cast iron water pipe 3 in. in diameter, until June 11.

St. Lambert, Que.
Tenders for laying about 25,000 sq. yds. of asphalt pavement on a 5 in. concrete base will be received until June 11 by the City. E. Drinkwater, engineer.

St. Therese, Que.
Tenders are invited by the Town Council for sewers, until June 18. S. Ouimet, engineer, 76 St. Gabriel St., has plans and specifications.

Toronto, Ont.
Tenders for concrete sidewalks for several streets in York Township are being received until June 11 by the engineer, F. B. Goedike, 40 Jarvis St.

Tenders for contract No. 1014 calling for grading in Huntley Township from Carp to Hodgins Corners, about 3 miles, will be received by the Provincial Highways Department, until June 25.

York Township contemplates laying cast iron watermains on Dilworth Cres., 625 ft.; Burgess Ave., 1,258 ft.; Knight Ave., 334ft.; Lesmount Ave., 1,383 ft.; Edison Ave., 719 ft.; Don Mills Rd., 795 ft.; Cardona Ave., 1,383 ft.; Carlaw Ave., 540 ft.; Sproul Ave., 334 ft.; and Gordon Ave., 686 ft. W. A. Clark, 40 Jarvis St., Toronto, clerk.

York Township may install watermains, 6 in., cast iron pipe, on coxwell, Queensdale and Poulton aves., at a cost of $6,000. W. A. Clark, 40 Jarvis St., Toronto, clerk.

York township contemplates watermains for the following streets: Carrington Ave., 357 ft.—Glenhaven St., 535 ft. —Hillsdale Ave., 562 ft.—Larratt Ave, 2,086 ft.—Orla Ave., 371 ft.—Spndicate Ave., 1,083 ft.—Sixth St., 336 ft. These watermains will consist of 6 in. cast iron pipe.

West St. John, N. B.
Tenders will be called shortly by the City for watermains, 24 in. by 16 in.; B. W. Wigmore, Commissioner of Water and Sewage.

Winnipeg, Man.
The city will receive tenders for cast iron waterpipe until June 11. Plans and specifications may be had from the City engineer, C. J. Brown.

CONTRACTS AWARDED

Acton Vale, Que.
R. T. Smith & Co., 27 Hillsdale Ave., Montreal, has been awarded the contract for the filtration plant for the waterworks at Acton Vale. Canadian Des Moines Steel Co., St James St., Montreal, will supply the steel tower and tank. E. Prevost, Acton Vale, has the piping contract.

Campbellton, N. B.
The contract for 21,000 sq. yds. of hot mixed paving for Water St., has been awarded by the Town to Etephens Construction Co., 124 Prince William St., St. John.

Chatham, Ont.
The Kent County Roads Committee has awarded McCoy and Shaw, Wallaceburg, the contracts for laying pavements in the northern sections of the county.

Cornwall, Ont.
Contracts awarded by the counties of Stormont, Glengarry and Dundas for roadwork are as follows: No. 32 at $18,783 and 36 at $6,392, F. M. Eagleson, Winchester; No. 33 at $27,069 and 38 at $35,098, McIntosh and McDougall, Cornwall; 34 at $5,433, 40 at $4,081, 41 at $7,348 and 43 at $4,910; J. B. Wilkinson, Port Hope; 35 at $7,000 F. M. Eagleson Port Hope; 37 at $9,668, 39 at $6,865, 42 at $8,300, 44 at $8,491, 46 (south end) at $12,,528 and $15,913. McLean & Stidwell, Cornwall; 45 at $1,935, Nephew & McMillan, Finch; 46 (north end) W. J. Callum, Apple Hill.

Guelph, Ont.
Towland Construction Co., Mount Forest, have the contract for grading at the Exhibition Park for the City at $0.65 per cu. yd.

The Construction & Paving Co., Confederation Life Bldg., Toronto have a contract for asphalt re-surfacing, for the city at $1.86 a sq. yd.

Hamilton, Ont.
A contract for sewers has been awarded by the City to Webster Construction Co., 134 Darling St., London, at $28 500.

The City has awarded J. H. McKnight 88 St. David St., Toronto, the contract for overflow sewers on McNab St. and Main St., totalling 922 lineal feet. These sewers will be of brck. 4 ft. 6 in. diameter. The cost will be about $34,839.

Islington, Ont.
Etobicoke Township Council has awarded the contract for laying watermains to Central Foundation Co. Ltd. 14 Wellington St., Toronto. Pipe will be supplied by the National Iron Corporation, Cherry St., Toronto; specials and hydrants, J. T. Hepburne Ltd., Van Horne St., Toronto; valve box, Drummond McCall & Co., Front St., Toronto; valves, T. McAvity & Sons, 13 King St., St. John, N. B.

Leamington, Ont.
Chick Contracting Co. Ltd., McDou-

gall St., Windsor, have the contract for a concrete pavement on Oak St. to the 1st Concession Road, at $50,000.

Montreal, Que.
General contract for sewers for the City on Hingston St. from Sherbrooke St. to the C. P. R. tracks and on Augier St. from Parthenais St. to Delomimer Ave., have been awarded to C. Perlubbi, 407 Lebrecque St.

Toronto, Ont.
The Grant Construction Co., which has the general contract for a section of the Provincial Highway at Burlington, has awarded the contract for the removal of 7,000 cu.yds. of old macadam to the Toronto Contracting & Haulage Co., 505 Lumsden Bldg., Toronto.

Williamstown, Ont.
MacLean & Stidwell, Cornwall, Ont., have the general contract for a macadam road three miles long and twelve feet wide, for Charlottenburg Township.

Railroads, Bridges and Wharves

Chateau Richer, Que.
Town Council contemplates a steel bridge 50 ft. long. Work will commence within a few weeks. F. X. Drouin, secretary.

Niagara Falls, Ont.
Plans have been prepared by the Canadian National Railways, Montreal, for a concrete bridge of the overhead type with two foot sidewalks.

St. John, N. B.
New Brunswick Power Co., Dock St., will relay rails on Mill and Main Sts. The company will be in the market shortly for concrete and rails.

South Woodslee, Ont.
Tenders for two concrete bridges in Maidstone Township will be received by A. Mousseau, clerk, R. R. 1., South Woodslee, until June 11. Plans and specifications are at the clerk's office and at the offices of Lard & Laird, Essex.

Toronto, Ont.
The Provincial Department of Public Works will receive tenders for the construction of a subway under the C.N.R. tracks on Danforth Ave. This work is estimated to cost $100,000.

CONTRACTS AWARDED

Chatham, Ont.
Contracts for four bridges costing $5,234, were awarded to W. E. Lamb, Wallaceburg, by the Kent County Roads Committee.

John Tewkesbury & Son, 224 Lacroix St., have the contract for two bridges for the city, costing $4,234.

Montreal, Que.
Dufresne Construction Co., 436 Pie IX Ave., will reconstruct subways on Ontario St. east, for the City.

St. Stephen, N. B.
Contracts for restoring dams on the west branch of the Musquash river have been awarded by the Provincial Government to Allain Construction Co., St. Stephen and New Brunswick Contracting Co., St. John.

Toronto, Ont.
Angelo Cavotti, 257 Euclid Ave., has the contract for bridges for Peel County. Arthur Cook, Cooksville, has the grading contracts.

Vancouver, B. C.
Six miles of logging railway will be constructed for the Merrill & Ring Lumber Co., Vancouver, by W. L. Coulton, Theodosia Arm, B. C. This spur will be built on Vanvouver Island. Steel has not yet been purchased.

Public Buildings, Churches and Schools

Edmundston, N. B.
Beaule & Morrissette, 21 d'Aiguillon St., Quebec, are preparing plans for a church of stone and concrete constructon.

Fredericton, N. B.
Tenders will be called immediately for the excavating and the construction of the basement for the Memorial Hall and laboratories. The foundation will be of concrete, 104 x 107. Plans were prepared by F. Neil Brodie, 42 Princess St., St. John.

Gravenhurst, Ont.
Tenders will be called shortly by the school board for a brick school, two storeys high, basement and eight rooms.

Guelph, Ont.
The Provincial Government, Department of Public Works, has awarded the Canadian Engineering & Contracting Co. Ltd., James St., Hamilton, the contract for a Memoral Hall costing $137,000.

Hamilton, Ont.
Tenders for the addition to the general hospital wll be received until June 11. Plans and specifications may be seen at the offices of Whitton & Walsh, architects, 7 Hughson St. south.

Huntsville, Ont.
Tenders for the addition to the school will be received by the secretary of the board, until June 16. H. Proudfoot, secretary; J. Wilson, Collingwood, architect.

Long Branch, Ont.
Tenders for the construction of an addition to the school building at Long Branch, Etobicoke Township, will be received by Walker & Gibson, 70 Victoria St., Toronto, until June 15.

Lunenburg, N. S.
Unity Masonic Building Co. Ltd., Lunenburg, has called for tenders for a Masonic Temple costing $25,000. W. E Knock, president of the organization will receive tenders until June 12.

North Bay, Ont.
The general contract for an addition to the convent of the Sisters of St. Joseph has been awarded to D. Barker, 82 Second Ave. east. Materials for this building, 66 ft. by 50 ft. concrete and brick construction, have not yet been purchased.

Ottawa, Ont.
Millson, Burgess & Hazlegrove, 185 Sparks St., will prepare plans for a fire station for the City. The building will probably cost $30,000. R. Burnett, Fire Chief.

Quebec, Que.
H. Laberge, ,103 John St., s preparing plans for a school to be built at Beauport, Que. The building will be of frame construction two storeys high.

St. Antonin, Que.
Napoleon Berube, contractor, Bic, Que., has the general contract for an extension to the church, here, costng $30,000. Pierre Levesque, 115 St. John St., Quebec, architect.

St. John, N. B.
Because tenders were too high plans for the $30,000 Sunday school for St. David's Church will be revised by F. Neil Brodie, Princess St., St. John. New tenders will be called.

The City Contemplates the construction of an incinerator costing $40,000. G. G. Hare, engineer.

Sault Ste. Marie, Ont.
Tenders will be called about June 7 for a nurses' home to be erected by the Gibson Memorial Fund. Findlay $ Foulis, 527 Queen St. east, architects.

Sarnia, Ont.
F. R. Reeves, 261 South Broad St., will receive tenders, after June 9, for the Construction of a Sundad school costing $25,000. W. G. Murray, architect, Dominion Savings Bldg., London.

Stroud, Ont.
General contract for the construction of a school building two storeys high, brick construction, has been awarded to Horton & Smith, Cumberland Ave., Hamilton, Ont. Thomson & Chown, Toronto architects.

Sudbury, Ont.
P. J. O'Gorman, architect, Sudbury, will receive tenders for the erection of a Roman Catholic church at Sudbury, until June 16. Rev. T. H. Trainor, interested.

Thessalon, Ont.
About June 15 the School Board will call for tenders for the construction of a school costing $32,000. T. R. Wlkes, 612 Queen St., Sault Ste. Marie, architect.

Three Rivers, Que.
Les Filles de Jesus, Three Rivers, contemplate building a convent costing $300,000. The architect has not yet been appointed.

Toronto, Ont.
Tenders will be called shortly for a $75,000 Sunday School for High Park Methodist Church. F. E. Belfrey, 2 Bloor St. east, architect.

Central Baptist Church, Cassell Memorial Hall, Bloor St. west, contemplate building a church costng $150,000. Q. B. Henderson, 578 King St. west, chairman of the buildng committee.

Tenders for Court House and schools, including the construction of the Court House at Haileybury and a Consolidated schaal house at Charlton, will be received by the Department of Public Works until June 18. Tenders will not include plumbing, heating, and electric wiring. H. F. McNaughton, secretary.

Bulk and separate tenders for all trades in the erection of two, two-room additions to Fairband Memorial and Wilcox schools, York Township, will be received by Burden & Gouinlock, 101 King St., Toronto.

Windsor, Ont.

D. Grand, 616 Pierre Ave., will call for tenders for an eight-room school building for the Separate School Board about July 1. The building will be two storeys high, 85 ft. x 108 ft., concrete and brick construction.

CONTRACTS AWARDED

Belleville, Ont.

Thomas Manley & Sons, Belleville, have been awarded the general contrect for a school by the Frankford School Board. Howe & Hagerman, Belleville, will install plumbing and the ventilating system.

Brampton, Ont.

General contract for the construction of an eight roomed school at Brampton, Ontario, has been awarded to Horton & Smith, builders and general contractors, 964 Cumberland Avenue, Hamilton.

Horton & Snider, 32 Rosslyn Ave. North, Hamilton, have been awarded the general contract for a school at the corner of Elliott & Craig Sts., costing $58,000. Higgins & Large, Brampton, have the plumbing and heating contracts.

Brantford, Ont.

Hamilton Bridge Works Co. Ltd., Hamilton, have the contract for steel for the collegiate institute. Casper Braun, 295 King St. West, Kitchener, has the contract for cut stone.

Kitchener, Ont.

Canadian Bridge Co., Walkerville, has the contract for steel for the City Hall. H. C. Lefroy Engineering Co., Toronto, has contracts for steel sash and reinforcing steel roofing and sheet metal contracts have been awarded to Brown Jarvis Roofing Co., 9 George St., Brantford.

Montreal, Que.

Dominion Bridge Co., Dominion Station, Lachine, have the contract for steel for a $200,000 church for the Trinity Memorial Congregation. Cut stone will be supplied by Morrison Quarry Co., 128 Bleury St. Remainint trades not yet let.

Nanaimo, B.C.

J. A. Hurry, Vancouver, has the contract for a $30,000 business block for Ashar Lodge, A.F. and A.M. The building will be three storeys high.

Port Arthur, Ont.

C. W. Cox, Port Arthur, was awarded the contract for wrecking the old Courthouse and Jail, excavating for and constructing the foundation for the new building.

Quebec, Que.

O. Picard & Fils, 199 St. John St., have contracts for plumbing, heating and wiring a four storey addition to a concent for Reverend Sisters l'Esperance.

Regin Sask.

The general contract for a Collegiate Institute, costing $100,000,has been awarded by the School Board to Smith Bros. & Wilson, Regina.

St. John, N. B.

B. Mooney & Sons, Queen St., St. John, have the contract for a $15,000 Memorial Hall for the Church of England Institute, and have let the following sub-trades: Steel, St. John Iron Works, Vulcan St.; plumbing, heating and ventilating, F. S. Walker, Church St.; plastering and glazing, J. N. Pullen, Horsefield, St.

Sedley, Sask.

Smith Bros. & Wilson, Regina, have the general contract for a convent for the Sisters of Loretto, Toronto, Ont., costing $55,000.

Business Buildings and Industrial Plants

Allandale, Ont.

The Beacon Tire & Rubber Co. has purchased a three and a half acre site and propose to build a factory. W. Feldman, vice-president.

Hamilton, Ont.

Hall & Duerr, Lumsden Bldg., Toronto, are preparing plans for a theatre costing $200,000. G. E. Swanwick, 108 James St., North, interested.

Kenora, Ont.

Backus-Brooks Co., International Falls, Minn., U.S.A., will erect a paper mill here having a capacity of 100 tons daily. J. T. McLellan, Kenora, construction manager.

Kingsville, Ont.

Kingsville I.O.O.F. may erect a three storey building containing stores and lodge rooms at a cost of $15,000.

Montreal, Que.

Church Ross Co. Ltd., 10 Cathcart St., will probably let sub-trades for the $20,000 factory for Dominion Oilcloth & Linoleum Co. Ltd., St. Catherine St. West.

Quebec, Que.

Plans are being prepared for the Quebec Liquor Commission, 229 St. Joseph St., for offices and warehouses costing $500,000. H. Laberge, 103 John St., architect.

Toronto, Ont.

Dominion Realty Co., 23 King St. West, will prepare plans for a two storey business block, 100' x 87', brick construction, for the Canadian Bank of Commerce.

Upper Bedford, Que.

The Terrington Co., Upper Bedford, contemplate adding a storey to their factory at a cost of $20,000. D. J. Reid is the manager of the company.

CONTRACTS AWARDED

East St. John, N. B.

St. John Dry Dock and Shipping Co., East St. John, have awarded the following contracts for buildings to be erected at Courtney Bay: Fabrication Shop, E. G. M. Cape Co., 10 Cathcart St., Montreal; offices, E. G. M. Cape Co.; power house, J. A. Grant & Co., Market Sq., St. John. Materials for these structures has not yet been purchased and will include steel, cement, brick, metal sash, etc.

Megantic, Que.

Newton Dakin Construction Co., 910 New Birks Bldg., Montreal, are also building a coaling plant at Megantic for the C. P. Railway.

Montreal, Que.

E. G. M. Cape & Co., 10 Cathcart St., Montreal, have the general contract for an extension to "Elevator B" for the Harbor Commission. Sub-trades may be let by the general contractor.

The steel contract for the $3,000,000 office building being built for the Insurance Exchange Corp. Ltd., by Anglin-Norcross Ltd., has been awarded to Dominion Bridge Co., Lachine. Garth Co. Ltd., 28 Craig St. West, have the electrical contract. Other sub-trades may be let shortly.

Outremont, Que.

Newton-Dakin Construction Co., 910 New Birks Bldg., will build a $40,000 coaling plant for the C.P.R. at Outremont yards.

Rimouski, Que.

Repairs to the "Banque Nationale" building will be made by Zenon Ouellet, contractor, Rimouski. Pierre Levesque, architect, Quebec, Que.

Sydney, N. S.

New Sydney Hotel Co. Ltd., has awarded the Nova Construction Co. Ltd., Sydney, the contract for a five storey hotel, 78 ft. x 158 ft., brick construction.

Toronto, Ont.

Bennett & Wright, 72 Queen St., have the contracts for plumbing and heating for the garage being erected by Sullivan & Fried for the City Dairy. Steel sash will be supplied by A. B. Ormsby Co. Ltd., Abell St., and Henry Hope & Sons, Yonge St.

Contracts awarded for the Roncesvalles car-sheds, being built for the Toronto Transportation Commission by Sullivan & Fried, 81 Victoria St., are: Excavating, Lioni & Co., 1450 Dufferin St.; reinforced steel, H. C. Lefroy Engineering Co., 11 Leader Lane; steel partitions, Fireproof Door Co., Cherry St., steel doors and sash, A. B. Ormsby Co. Ltd., 48 Abell St.; ventilating, sprinklers, heating and plumbing, Mechanical Trades Co., 54 University Ave.; electrical, Richardson & Cross, 81 King St. East; structural steel, McGregor & McIntyre, Ltd., 1139 Shaw St.; miscellaneous iron, Mahaffy Iron Works, 4 Trafalgar Ave.; roofing and sheet metal, W. J. Carmichael Ltd., 918 Palmerston Ave.

Further contracts awarded for the addition to the store of Robert Simpson Co., are: Glass and glazing, Consolidated Plate Glass Co., Spadina Ave., face brick, Toronto Brick Co., Sun Life Bldg.; fireproofing, Interlocking Tile Co., Toronto St.; metal windows, Fireproof Door Co., foot of Cherry St.

Reinforced steel for the garage being built for the City Dairy Co., costing $110,000, will be supplied by Burlington Steel Co., 60 King St. West, Toronto.

Residences

Cannington, Ont.

J. S. Thatcher, 37 Cowan Ave., Toronto, is preparing plans for a $22,-

000 residence for Mr. McKinnon, c/o architect.

Kitchener, Ont.
Tenders for a residence costing $25,000 will be awarded by the owner, W. T. Staff, 72 Wilmot St. Plans were prepared by J. S. Thatcher, 37 Cowan Ave., Toronto.

J. S. Thatcher, Toronto, also prepared the plans for a $15,000 residence for M. Ford, 72 Wilmot St., who will let necessary trades.

Montreal, Que.
A. Liger, 243 Decaire St., will start work shortly on a residence costing $10,000. Sub-trades will probably be let.

Ottawa, Ont.
Cowie & Moore, Craig St., general contractors, are in the market for brick, concrete and other materials for a residence costing $15,000.

Outremont, Que.
Work will commence shortly on two cottages costing $30,000. L. Farlton, 393 Wiseman ave., builder will probable let the sub-trades. Materals have not yet been purchased.

Sault Ste. Marie, Ont.
Plans are being prepared for a residence and barns for the Royal Stock Farm, Korah Township. Albert Wood, 136 Pilgrim St., Sault Ste. Marie, owner.

Toronto, Ont.
J. Thistlewaite, 722 Annette St., will receive tenders for heating, plumbing, electrical and plastering contracts for a residence costing $10,000.

W. H. Shaw, 21 Oakmount Rd., architect, will let all trades for a residence costing $18,000.

Plastering, electrical, plumbing and heating contracts for a $10,000 residence and garage for E. H. Menges, 20a Gibson Ave., will be let by Geo. Proctor, builder 30 Heathdale Road.

Walkerville, Ont.
F. J. McDonald, general contractor, c/o F. Keane, 21 La Belle Bldg., Windsor, has not yet secured the materials necessary for the construction of a $12,000 residence.

Windsor, Ont.
G. P. Jacques, 3 Ouelette St., is preparing plans for an apartment house containing twenty suites, costing $75,000. Tenders will be called about June 15.

CONTRACTS AWARDED

Hamilton, Ont.
Jas. Ireland, Belleview Ave., has the general contract for a residence for J. Turner, 22 Homewood Ave., costing $30,000. Robert Fitzsimons, 21 Rebecca St., has the plumbing contract and Hill Bros., Rosslyn Ave. North, the plastering contract.

Toronto, Ont.
Contracts for plumbing, heating, wiring, plastering and painting for a residence costing $10,000 may be let by W. A. Booth, 102 Summerhill Ave.

Vancouver, B. C.
Fred Melton, 1707 William St., Vancouver, has been awarded the contract for two apartment blocks costing $60,000 for Henry & Melton, Vancouver.

Westmount, Que.
Contracts awarded on a residence for R. H. Gilday, 598 Grosvenor St., are as follows: Roofing, Campbell Gilday Co. Ltd., 793 St. Paul St.; electrical, Booth Bros., 5727 Sherbrooke West; plumbing and heating, A. Morrow, 110 Madison Ave.; plastering and tiling contracts have not yet been let.

Power Plants Electricity and Telephones

Belleville, Ont.
The Bancroft Light, Heat & Power Co., have commenced construction of a system of dams on the York branch of the Madawaska River, North Hastings, to develop 2,500 h.p. As soon as the increased power is required on extension will be made to the plant capable of developing an additional 3,000 h.p.

Kenora, Ont.
Re-modelling of the power plant at Kenora is contemplated by the Backus-Brooks Co. J. T. McLellan, construction manager.

Niagara Falls, Ont.
Canadian Niagara Power Co. will build a transformer station by day labor. The building will be one storey high, 150' x 20', and will cost about $150,000.

Peterough, Ont.
S. R. Armstrong, secretary of the Peterborough Public Utilities Commission, will receive tenders for the construction of a building for an electrical distributing station, until June 12.

Sturgeon Falls, Ont.
Backus-Brooks Co., International Falls, U.S.A., plan to build a power transmission line from Sturgeon Falls to Fort Frances. J. T. McLellan, Kenora, construction manager.

Toronto, Ont.
Plans for an addition to the Carlaw Ave. Sub-station are being preparde by the Toronto Electric Commission and tenders will be called about June 15.

The Ontario Government has granted Hollinger Gold Mines a new power site at Portage Place, on the Abtibi, about 60 miles from the mines. Tenders will be called shortly by the company for the construction of a power plant. At present the company plans to develop about 20,000 h.p.

Miscellaneous

Chatham, Ont.
The contract for the renewal of a revetment wall, 185', at McGregor's Creek, has been awarded to Wm. Bermingham, Centre St., Kingston, by the Dominion Government.

Hamilton, Ont.
The Dominion Government, Department of Public Works, Ottawa, contemplates dredging the bay at the foot of Wellington St. R. C. Desrochers, Ottawa, secretary.

St. John, N. B.
Tenders for the construction of a steel stairway in the Public Hall will be received by the council until June 11.

Three Rivers, Que.
Tenders for a kiln and heating system have been called by Asselin & Denoncourt, 42 Alexandre St., for a building 1½ storeys high of brick and steel construction.

Toronto, Ont.
Tenders will be received by the City until June 19 for the installation of sanitary conveniences in a number of residences. Specifications are at the office of the Mechanical Officer of Health, City Hall.

Weston, Ont.
The Council has retained James, Proctor & Redfern Ltd., Consulting Engineers, of Toronto, to prepare a report and an estimate on the cost of sewers for the south section of the town.

Fires

Morse, Sask.
Fire totally destroyed the electric power plant causing a loss of $12,000.

New Railroad for Panama

It is reported that in accordance wth Law 6 of 1923, a contract between the executive branch of the Government of Panama and Enrique L. Hurtado, according to the text of the law appearing in the Gaceta Oficial, was entered into on September 15, 1922. The contractor is to construct 30 miles, more or less, of narraw-gauge railway from Caledonia Bay, on the Atlantic coast, to a point between the Ucurganti and Sanson Rivers in the valley of Chucunaque, near the Colombian border. The contractor is further required to construct one or more wharves at the Caledonia Bay terminal of the railway, which will accommodate vessels of 1,000 tons; to build stations necessary; and to furnish the equipment required for the operation of the railway. Service is to be provided for public traffic at least once a week, and oftener if necessary.

To Build Railway in China

A contract for the construction of a 1,200 mile railway in South China has been let by the Sun Yat Sen adminstration to the Northern Construction Company, Vancouver, B. C. The contract was signed during the recent visit to the Orient of C. V. Cummings, fice-president of the company. Mr. Cummings admitted the accuracy of this information when interviewed, but stated that he could not discuss the matter at this stage.

At the office of the Canada Morning News, the Chinese Nationalists daily published in Vancouver, it was stated that the railway is part of Dr. Sun's scheme to link up the provinces, passing en route Kwangsi and Yunnan provinces.

When construction can begin is problematical. The South China Govern- has some heavy financing to do before the work can be entered into. As the Canton Government is still engaged in warfare, consolidating its territory in the south, this financing may be faced with difficulty.

It is estimated that the work will cost between $25,000,000 and $35,000,000. One section of the line will pass through mountainous territory.

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Heating Tenders Wanted

[illegible] will be received by the undersigned [illegible]

June 16th, 1923,

[illegible] o'clock, noon, for supplying all plans, supervision, fittings and apparatus for the installation of a suitable forced circulation hot water system for new Car Barns located at King St. E., Kitchener. The Kitchener Light Commission to supply all the necessary pipe and labor for installing same. The plans of new Car Barn can be seen at the office of the undersigned.

Kitchener Light Commission,
169 King St. W.,
Kitchener, Ont.
23

Tenders for School

Bulk tenders, sealed and marked "Tender," will be received by the undersigned until 5 p.m.

June 15th, 1923,

for the erection of an addition to the school building at Long Branch, Township of Etobicoke.

Plans and specifications may be seen at the office of the architects, 70 Victoria St., Toronto, or may be obtained on deposit of $10.00 refundable on their return within the time agreed.

Tenders must be on the form provided by the architects and be accompanied by a guarantee company's bond or marked cheque for 2½% of the tender.

The successful contractor will be requred to furnish a fulfilment bond when the contract is signed.

The lowest or any tender not necessarily accepted.

WALKER & GIBSON,
Architects and Engineers.
23

Notice to Contractors

Sealed tenders marked "Tenders for Contract No. 1013" will be received by the undersigned until 12 o'clock noon,

Monday, June 25th, 1923,

for the excavation, drainage and other work necessary to build a subway under the Canadian National Railway on the Provincial Highway between Concessions A and B and in front of Lot 32, Township of Scarboro.

Plans and specifications may be seen on and after Wednesday, June 6th, 1923, at the office of the undersigned. A marked cheque for $5,000.00 payable to the Minister of Public Works and Highways, or a Guaranty Company's Bid Bond for a similar amount must accompany each tender. A Guaranty Company's Contract Bond for 50 per cent of the amount of the tender will be required when the contract is signed.

The lowest or any tender not necessarily accepted.

Bonds must be made on forms furnished by the Department.

W. A. McLEAN,
Deputy Minister of Highways.
Department of Public Highways, Ontario,
Toronto, May 31st, 1923. 23

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

CITY OF OWEN SOUND

SEWERS

Sealed tenders addressed to the undersigned will be received up to 5 P.M.

June 14th, 1923,

for the construction of approximately 5,000 lineal feet of 42" to 12" sewers.

All necessary information may be obtained at the City Engineer's Office.

Envelopes should be plainly marked as to contents and tenders accompanied by a marked cheque for five per cent. of the amount of the tender and the name of an approved Guaranty Company.

The lowest or any tender not necessarily accepted.

D. H. FLEMING,
City Engineer.
23

TENDERS
for Railway Construction

The Nipissing Central Railway Company

Sealed tenders for the works (other than steel work for bridges) necessary to the complete construction of the roadbed, ready for the ties and rails, and the tracklaying, ballasting and fencing, upon approximately twenty-five miles of a branch of the Nipissing Central Railway, extending from Swastika on the Temiskaming and Northern Ontario Railway, to a point at or near Larder Lake, will be received at the office of the Secretary Treasurer of the Company, North Bay, until twelve o'clock (noon) of the

12th day of June 1923,

On receipt of a request in writing, a copy of each of the following documents:

Instructions to Bidders,
Form of Tender,
Specifications,
Form of contract

will be furnished to intending bidders, at the office of the Chief Engineer of the Company, North Bay, where plans and profiles pertaining to the work, may also be seen.

The right is reserved to reject any or all bids.

S. B. CLEMENT,
Chief Engineer.
North Bay, Ont.,
May 23, 1923. 22-23

TOWNSHIP OF MINTO

TENDERS
for Municipal Drains

Sealed tenders will be received by the undersigned up to noon of

Monday, June 18th, 1923,

for the construction of Municipal Drains Nos. 11 and 12 in the Township of Minto, consisting of 23814 cub. yds. of excavation for open ditches and 2342 lineal feet of tile drains.

Plans, profiles and specifications may be seen at the office of the undersigned, Harriston, Ont.

A marked cheque on a chartered bank or a Guaranty Company's bond for 7 per cent of the amount of the tender will be required when the Contract is signed.

The lowest or any tender not necessarily accepted.

W. D. McLELLAN,
Clerk of the Township of Minto.
23-24 Harriston, Ont.

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 4, Section C—subsection (a)" will be received by the undersigned until eleven a.m. standard time on

Wednesday, June 20th, 1923,

for the excavation of approximately 33,000 cubic yards of earth and other work required in the construction of Provincial highway from Broadview to Oakshella, 9 miles.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:—

W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask; Arthur Boyer, Sec.-Treas., R.M. No. 154, Broadview, Sask.

An accepted cheque for the sum of $700.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of three p.m. standard time, on Wednesday, June 20th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER
Deputy Minister of Highways.
Department of Highways,
Regina, Sask., May 30th, 1923. 23

Tenders for Dredging

Sealed tenders addressed to the undersigned and endorsed "Tender for dredging," Port Arthur or Fort William, Ont., as the case may be, will be received until 12 o'clock noon (daylight saving)

Wednesday, June 20th, 1923,

for dredging required at Port Arthur, Ontario, and at Fort William, Ontario.

Tenders will not be considered unless made on the forms supplied by the Department and according to conditions set forth therein.

Combined specification and form of tender can be obtained on application to the undersigned, also at the offices of the District Engineers, Custom House Building, Fort William, Ontario, and Equity Building, Toronto, Ontario. Tenders must include the towing of the plant to and from the work.

The dredges and other plant which are intended to be used on the work shall have been duly registered in Canada at the time of the filing of the tender with the Department, or shall have been built in Canada after the filing of the tender.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, for 5 p.c. of the contract price, but no cheque to be for less than fifteen hundred dollars. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, June 1st, 1923. 23-24

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 3, Section D" will be received by the undersigned until eleven a.m. standard time on

Wednesday, June 20th, 1923,

for the excavation of approximately 46,000 cubic yards of earth and other work required in the construction of Provincial highway from Melfort West, 14 miles.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:—

W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask; E. D. Carwardine, Town Clerk, Melfort, Sask.

An accepted cheque for the sum of $700.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of three p.m. standard time, on Wednesday, June 20th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER
Deputy Minister of Highways.

Department of Highways,
Regina, Sask., May 30th, 1923. 23

Temiskaming and Northern Ontario Railway Commission

Tenders Wanted

Sealed tenders addressed to W. H. Maund, Secretary-Treasurer, The Temiskaming and Northern Ontario Railway Commission, North Bay, Ontario, will be received until twelve o'clock noon of

Tuesday the twelfth day of June

for the erection of an extension to the office building at North Bay, Ontario.

Plans, specifications and form of tender may be obtained at the office of the Chief Engineer, North Bay and are also on file at the office of the Contract Record, 347 Adelaide St. West, Toronto.

An accepted cheque on a chartered bank of Canada equal to five per cent of the tendered price, must accompany each tender.

The lowest or any tender will not necessarily be accepted.

S. B. CLEMENT,
Chief Engineer,
North Bay, Ont.

May 23rd, 1923. 22-23

Notice to Contractors

Sealed tenders marked, "Tender for Contract No. 1014," will be received by the undersigned until 12 o'clock noon on

Monday, June 25th, 1923,

for the following work on the Provincial Highway:-

Contract No. 1014—Grading in the Township of Huntley from Carp to Hodgins Corners, approximately three miles.

Plans and specifications may be seen on and after Wednesday, June 6th, 1923, at the office of the Resident Engineer, R. S. Smith, Renfrew, Ontario, and at the office of the undersigned.

A marked cheque for $500.00, payable to the Minister of Public Works and Highways, or a Guaranty Company's Bid Bond for a similar amount must accompany each tender. A Guaranty Company's Contract Bond for 50% of the amount of the tender will be required when the Contract is signed.

The lowest or any tender not necessarily accepted.

Bonds must be made out on forms supplied by the Department.

Deputy Minister of Highways.
W. A. McLEAN,

Department of Public Highways, Ontario.
Toronto, June 1st, 1923. 23

For Sale

Complete Concrete Road Making Equipment

Ford Trucks with Lee Dump Bodies.
10 15 25 H.P. Motors.
Mathews Gravity Carrier.
200 ft. Heavy Conveyor.
Sand Screens.
2 International Time Recording Clocks, Racks, Cards.
Ingersoll Rand Compressor 4 x 5 Lakewood Concrete Chutes.

Frid Construction Co. Ltd.,
23 Hamilton, Ontario.

City of St. Lambert

Tenders for Pavement Wanted

Tenders are invited up to 5 P.M. (Daylight Saving Time)

Monday, June 11th, 1923,

for the laying of approximately TWENTY-FIVE THOUSAND (25,000) square yards of Asphalt Pavement on five (5") inch Concrete Base.

Plans may be seen, specification and form of tender had at the office of the undersigned.

The City reserves the right to reject any or all tenders.

Signed,
E. DRINKWATER,
City Engineer.

City Hall,
St. Lambert, Que. 23

To Contractors

Sealed tenders marked "Tenders for Court House and Schools" addressed to the undersigned will be received at this Department until

Monday, June 18th, 1923,

for the reconstruction of the Court House at Haileybury, Separate School Building at Haileybury, Public School Building at Haileybury and Consolidated School House at Charlton, for all trades, excepting plumbing, heating and electric wiring.

Plans and specfications to be seen at the office of the Sheriff in the Public Library, New Liskeard, and at this Department.

Each tender must be accompanied by an accepted bank cheque payable to the Honourable F. C. Biggs, Minister of Public Works and Highways, Ontario for five per cent. of the tender, and the bona fide signatures and addresses of two sureties, or the name of a Guarantee Company approved by the Department, willing to provide a bond for the due fulfilment of the contract.

The Department is not bound to accept the lowest or any tender.

By Order,

H. F. McNAUGHTEN,
Secretary, Public Works Department, Ontario.
Toronto, May 31st, 1923.

Newspapers publishing this without authority will not be paid for it. 23

Wanted to Rent

for five months, twelve ton, three wheel steam roller with 24 inch drive wheels and pressure scarifier. T. S. Scott, City Manager, Niagara Falls, Canada. 23

CONTRACTORS' EQUIPMENT

Two practically new ¾ yard London Concrete Mixers $1,500.00 also No. 6 London Gasoline concrete mixer, good condition $250.00. Tower equipment, small tools, wire cable, etc. Lumber in good condition various sizes up to ten feet lengths $10.00 to $15.00 per thousand. The Wm. F. Sparling Company, 54 University Ave., Toronto. 23

Tenders for Bridges

Sealed tenders will be received by A. J. Aldous, Township Clerk, Rockwood, up to 2.00 P.M.

Monday, June 18th, 1923,

for the construction of the following bridges:

[illegible] span at Harris Woolen Mills, Rockwood.

40 ft. girder span at Lot 8, Con. 4, Eramosa. For the Township of Eramosa.

Plans and specifications may be seen at the office of the Clerk and the Engineers on and after Monday, June 11th.

A. W. CONNOR & CO.,
34 Victoria Street,
Toronto.

23

FOR SALE

Fire Proof Vault Doors

We have for immediate delivery 50 vault doors clear opening 30" x 78" built special for 17" wall, instead of 20" wall which is our standard. We will dispose of all or part of these doors at a very reasonable price in order to sell them at once.

DOMINION SAFE & VAULT CO. LTD.,
Niagara Falls, Ont.

22-23

FOR SALE
At St. John, N. B.

3—Locomotive Type Boilers 72" diameter 23' 6" long, 1666 sq. ft. heating surface each. 140—3" diameter tubes. Built by Johnston Brothers, Terrysburg, Mich.

1—Scotch Marine Type Boiler 8' 0" diameter, 8' 6" long, 436 sq. ft. heating surface, 60—3½" outside diameter tubes. Built by Lobnitz, Renfrew, Scotland.

If interested write Box 229, Station B, Montreal.

22-23

FOR SALE

Sturtevant Heating Unit

Fan 9' 8" diameter

Steam Coils steel encased 8' 6" wide x 7' 8" high x 8' 6" long. Inlet for Exhaust Steam 10" dia. Also Inlet for Live Steam 1½' dia.

The above was used for heating our Bridge Shop which was destroyed by fire, and we accordingly offer it for sale.

PRICE; $1500.00 f.o.b. Cars, New Glasgow.

THIS IS A REAL BARGAIN.

The Maritime Bridge Co., Ltd.
NEW GLASGOW, N.S.

23

FOREMAN WANTED capable of taking complete charge of small buildings. Write stating experience, references and wages required, to Patterson Construction Co. Ltd., Belleville, Ont.

23

CONTRACTORS—Superintendent or General Foreman requires position. Life long experience. Thorough practical knowledge of Unit costs and supervision. Excellent references. Will go anywhere. Box 282, Contract Record, Toronto.

23-26

Price List for Drain Tile

3"	Tile	Weighs	4½	lbs.	$ 20.00 per 1000
4"	"	"	6½	"	$ 30.00 per 1000
5"	"	"	8	"	$ 42.00 per 1000
6"	"	"	11½	"	$ 51.00 per 1000
7"	"	"	14	"	$ 75.00 per 1000
8"	"	"	16	"	$ 90.00 per 1000
10"	"	"	24	"	$160.00 per 1000
12"	"	"	35	"	$220.00 per 1000

The quality of this product is guaranteed. These tile have been tested by the Ontario Agricultural College, Drainage Department and passed and secured their approval and recommendation.

Terms 2%, 30 days, or 5%, 10 days on approved accounts. All shipments are subject to draft and are F. O. B. Plant Port Dover. Government sales tax additional.

Erie Clay Products, Ltd.

23 Box 810 Simcoe, Ont.

Tenders Wanted

BOARD OF EDUCATION

Sealed tenders addressed to the Business Administrator and Secretary-Treasurer, Board of Education, Administration Building, 155 College St., endorsed with the word "Tender" and also with the name of the school building and trade or article to which it relates, will be received until

Tuesday, June 12th, 1923,

for

1. (1) Painting for Sundry Schools.
2. (2) Galvanized Iron Work for Riverdale Collegiate.
3. (3) Safety Treads for Perth Ave. School.
4. (4) Hardware for Leslie Gardens School.
5. (5) All Trades, Plumbing for Cottingham School—Alterations.
6. (6) All Trades, Plumbing, Brock Ave., School.
7. (7) Plumbing for Lansdowne School.
8. (8) Electric Wiring, Local Phones, Oil Burning Equipment for Silverthorne School.
9. (9) Steel Sash, Roofing for Jarvis Collegiate.
10. (10) All Trades on Basement Entrances Huron St. School.

Specifications and conditions of tendering may be seen and all information obtained at the office of the Architect of the Board, 155 College St., Telephone Trinity 8200.

Tenders must be in the office of the Secretarial Department at the Administration Building, 155 College St., not later than 4 P.M. on the day named, after which no tender will be received.

The lowest or any tender will not necessarily be accepted.

W. W. PEARSE,
Business Administrator & Secretary-Treasurer.
H. L. KERR,
Chairman Property Committee,
Pro Tem.

23

Some One Wants to Buy

The equipment or machinery that you are not using.

It may be occupying valuable space in your yard or shop, collecting dust, rust and hard knocks.

Sell it before "Depreciation" scraps it.

Use the Tender & For Sale Department. It helps others, let it help you.

REINFORCED CONCRETE GENERAL SUPERINTENDENT wants position on Buildings, Bridges or Elevators, can produce best results. Box 276, Contract Record, . 21-24

Experiments with Rubber

In the annual report of the Metropolitan Committee on Materials and Means of Paving the Streets of London it is stated that it is again noticeable that no new hard-wood paving is mentioned as having been laid down during the year. Where wood has been put down preference has undoubtedly been shown for creosoted deal.

Particulars are given of an experiment n rubber paving tried in the borough of Southwark. The rubber was laid in Borough High Street, a business thoroughfare, carrying a traffic of 240 tons per yard width per hour. The section paved varies from three to five yards in width between the kerb and tramway margin on one side of the road only, and is fairly level. Two types were laid:—

(a) 9 in. by 3 in. by ½ in. rubber, vulcanized on expanded metal and anchored to concrete. The area laid was 161 super yards. This has had two years' wear.

(b) 8 in. by 4 in. by 4 in. composite blosks laid on concrete foundation, similarly to wood blocks. Area laid, 20 super yards. This had had one month's wear only at the date of the return.

The work was carried but in December, 1920, and January, 1923. The foundation consists of 6 in. to 9 in. reinforced concrete, and the price of the paving (including cost of foundation and estimated cost of rubber blocks) is about £5 per super yard. The rubber was supplied free to the council who laid the paving with direct labor.

Mr. A. Harrison, the engineer and surveyor for the borough, states that in his opinion rubber has proved to be a most suitable material for road paving, showing a minimum of wear. Possibly the second type (the composite block) may prove to be the ideal form of using rubber for paving purposes. The other type presents difficulties in the way of attachment, but the whole matter should in Mr. Harrison's opinion, be regarded as still in the experimental stage.

Speeding up Construction

It is reported that one of the two important improvements in the port of Boulogne-sur-Mer, France, now in process of construction will receive a decided mpetus, since the National Government has authorized an additional appropriation of 9,000,000 francs for the extension of the sea wall forming the outer harbor. The wall is to be extended 500 meters (1 meter=3,28 feet), making a total length of 2 kilometers (1.24 miles). Approximately 15, 000,000 francs is also being spent on widening the entrance to the inner harbor from 50 meters to 100 meters; and a large dike, similar and parallel to the one now makng the north side of the inner port entrance, is being constructed. When this is complete the dike forming the north side will be removed and the channel dredged up to the line of the new dike.

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Montreal, Que.	- -	Lymburner Motors Inc. 3 Park Ave
Windsor, Ont.	- -	Thompson Auto 339 Pitt Street West

FEDERAL MOTOR TRUCK CO.
Detroit, Michigan

Late News

Brantford, Ont.
The contract for a $22,000 residence for Dr. J. A. Philip, 356 Colborne St., has been awarded to Petley & Co., Toronto.

Burlington, Ont.
A retaining wall on Brant St. is contemplated by the Town Council. Marken & Mackay, Hamilton, engineers. Mr. Sykes, clerk.

Byron, Ont.
London Health Association will have plans prepared for extensions to the sanatorium buildings at Byron costing [illegible]. Sir Adam Beck, president.

Hamilton, Ont.
Asphalt pavements for the following streets are contemplated by the City: Robert St.—James to John; Sanford Ave.—King to Barton St.; Morros Ave.—Glendale to T. H. & B. tracks; East Bend—King to Main St.; Dinsmure—Spadina to Prospect St.

Lindsay, Ont.
Wellington St., from Sussex to Cambridge Sts., may be paved by the Town. W. R. Alley, clerk.

Montreal, Que.
Dufresne Construction Co., Pie IX Ave., has been awarded the contract for the re-construction of a tunnel on Ontario St. The company is in the market for a concrete mixer.

Ottawa, Ont.
Contracts awarded by the Dominion Government for dredging are: In Ontario—Sault Ste. Marie, Soo Dredging & Construction Co., $18,200; Bowmanville, Randolph Macdonald Co., Toronto, $6,500; Port Hope, Frontenac Dredging Co. Ltd., Kingston, $6,500. Province of Quebec—Nicolet, $10,000 and St. Pierre, $8,000, Dufresne & Marchildon, Three Rivers; Riviere du Loup, $6,000, Lachance Ltd., Quebec.

Quebec, Que.
The Central Quebec Power Co. has been incorporated with a capital of $1,000,000. Interested in the company are: Jacques Peton, Auguste Mathieu and James M. Robertson, all of Montreal.

The Provincial Government, Department of Highways, has awarded W. S. Dakin, Sherbrooke, the general contract for a road from St. Jean to Rousses Point, costing $259,000.

St. Jerome, Que.
The Town Council contemplates laying sewers on Ste. Marguerite St. by day labor. A. P. Laplante, clerk.

Tavistock, Ont.
Tenders for the construction of the "Shakespeare" drain in South Easthope township will be received by the clerk, A. E. Roth, Tavistock, until June 26. John Rogers, Mitchell, engineer.

Thornbury, Ont.
Plans are being prepared for a waterworks system costing $20,000. James, Proctor & Redfern, 36 Toronto St., Toronto, engineers.

Toronto, Ont.
Waverley Road Baptist Church will receive tenders for all trades for a new Sunday school and an addition to the church. J. Gibb Morton, architect.

Walkerton, Ont.
G. E. Stephenson, Walkerton, engineer for Bruce County, will receive tenders until June 12 for twenty steel and cement culverts.

Whitworth, Que.
This village, about fifteen miles from Riviere du Loup, was wiped out by fire. About fifteen houses, the post office and the station. Forest fires are reported as the cause.

Extension of Railways

The executive branch of the Argentine Government is considering a plan for the extension of the state-owned railways involving an estimated expenditure of 300,000,000 pesos. The proposed programme would be completed in three or four years.

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Tenders

A few dollars spent in advertising your proposals in the
Contract Record
and Engineering Review
would result in additional competition which might save your city or town or your client many hundreds of dollars

BURLINGTON STEEL
COMPANY, LIMITED
HAMILTON CANADA

Specifications

A steel specification is a document for guidance to the manufacturer in producing an article, and a protection to the purchaser in accepting it. A specification should be written only after careful study of the production of the article, and an equally careful study of the use to which it is to be put.

Specification A-16-14, covering Rail Steel Bars, was issued by the American Society for Testing Materials only after the most careful investigation that has ever been made of any reinforcing material. In 1913, Professor W. K. Hatt, then of Purdue University (now on Mr. Hoover's staff), made over 3,000 tests on as many samples obtained under normal working conditions from four separate mills. Professor Hatt found that Rail Steel Bars had unusual strength, and furthermore, "excess ductility for its strength above usual grades of steel."

Specification A-16-14 is, therefore, everything that a specification should be. It is a protection to the purchaser. It assures him of getting Rail Steel Bars, proven by over 3,000 tests to have a quality factor (strength and ductility) in excess of usual grades of steel. This specification at the same time prevents any substitution of undesirable re-rolled material.

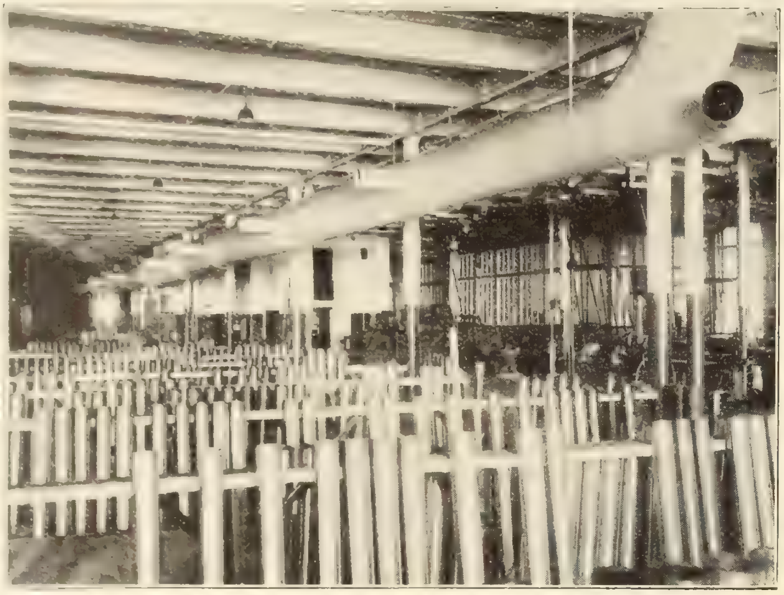
Specify your reinforcing steel to meet A.S.T.M. specifications A-16-14, or equal

You will be interested in the facts contained in this valuable book. A copy is yours for the asking.

Burlington Reinforcing Bars used in construction of new Farmers Dairy Building, erected 1922. Toronto, Ont.

Jackson Lewis Company
Gen. Contractors

Harkness, Louden & Hertzberg
Engineers



Human Efficiency

still depends on pure air—human comfort can't be had without it.

That is why Sturtevant heating and ventilating systems can do so much for the building trade generally—they go so far to insure the comfort and efficiency of every building's owners, tenants and employees.

Ask for folder 606

B. F. Sturtevant Company
of Canada, Limited.
Montreal - Galt - Toronto

Sturtevant
PUTS AIR TO WORK

Lunghai Railway Extended

The Netherlands Harborwork Co., has completed the section of the Lunghai Railway from Hsuchow east to the Grand Canal, a little less than half that part now under construction for connecting the eastern railroad at Hschow with the proposed port of Haichow. Trains are in operation over the entire line, a distance of 365 miles. Work is proceeding on the remaining part of the eastern section, and the only important bridge—that over the Grand Canal—is now practically completed.

According to present plans, the railway will terminate approximately halfway between the city of Haichow and the sea at a point which can be reached by small vessels. The placing of this eastern terminal will depend upon the exact location of a proposed deep harbor. No construction work has begun on the harbor, its development being dependent largely on the probable ultimate cost. No figures have been made public by the Netherlands Harborwork Co.

When the Lunghai system is completed, especially if the harbor development is carried out, it will open up and serve an important belt of country extending westward from the sea across the northern parts of Kiangsu and Honan Provinces and the central part of Shensi, whose capital (Sianfu) is to be the western terminus. It will also be of value to the southern districts of Shantung and Shansi and the northern portion of Anhwei, as it will run very close to their borders and will facilitate the establishment of motor feeder services to those now in operation between points in Honan and in Anhwei.

To Aid Road Builders

Individuals, companies, States, or municipalities that have constructed roads in Brazil will be assisted in paying for the work, under new regulations issued by the ministry of agriculture, industry, and commerce. The Federal Government will pay up to 2,000,000 milreis per kilometer, for stretches of not less than 20 kilometers. This will be paid only once, and plans must be submitted to the ministry in advance.

The State of Santa Catharina has contracted for a road to be built from the municipality of Cruzeiro to the Pipri-Guazu River on the Argentine border. It will join another road from Florianopolis, and the two will have combined length of 728 kilometers, of which 468 have already been completed and 80 more are about to be put in use.

More Ford Industries

Statements in the State Senate at Lansing recently to the effect that Henry Ford planned to build a factory on every small water power site he can obtain in Michigan and give winter employment, at city wages to the farmers, were confirmed by persons close to the automobile manufacturer.

The announcement was made by Senator Andrew B. Glaspie, of Oxford, and came during debate on a water power bill. He said if the bill was passed it would mean the establishment of additional industrial enterprises on Michigan aggregating 100,000,000 in value and giving employment to all farmers and their helpers, and good wages during the time when farm work is slack.

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Plain Ends, per doz.	$1.50
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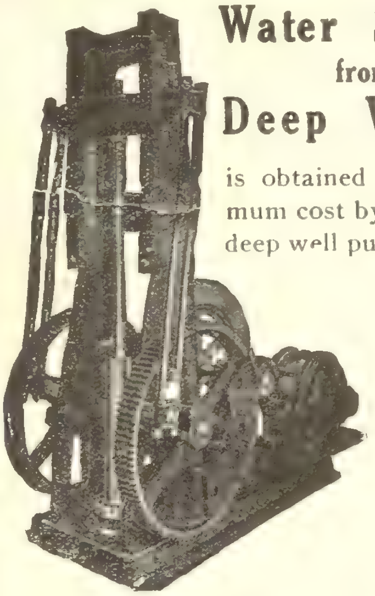
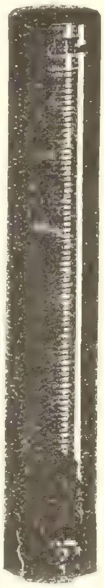
Also London, Eng.

Water Supply from Deep Wells

is obtained at a minimum cost by use of our deep well pumps.



Write for Bulletin 26 explaining the use of Cook's Patent Brass Tube Well Strainer



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Lawrenceburg, Indiana, U. S. A.

Manufacturer of a Complete line of **DEEP WELL SUPPLIES**, including Steam, Belt and Motor Driven **DEEP WELL PUMPS**, Wind-mill and Hand Pumps, Working Barrels and Valves, Pump Rods and Pump Rod Joints, Drill Rods and Drill Rod Joints, Drilling and Well Tools.

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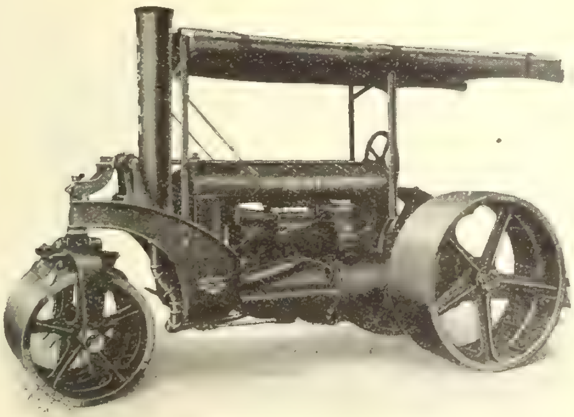

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A thoroughly efficient 3 ton, moderate priced Road Roller which does its work at a remarkably low cost for maintenance. It will do all the work of a light road roller, and besides, as a tractor, has ample power to pull a scraper, fresno, road machine or plow.

The economical operation of the Fordson Tractor is proverbial, and the wise combination of Austin Roller and Fordson Tractor permits not only of low first cost, but also cheapest prices for replacement parts.

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44

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High Duty gasoline engines for Peak Load and Emergency Generator drives at 1200 R.P.M.

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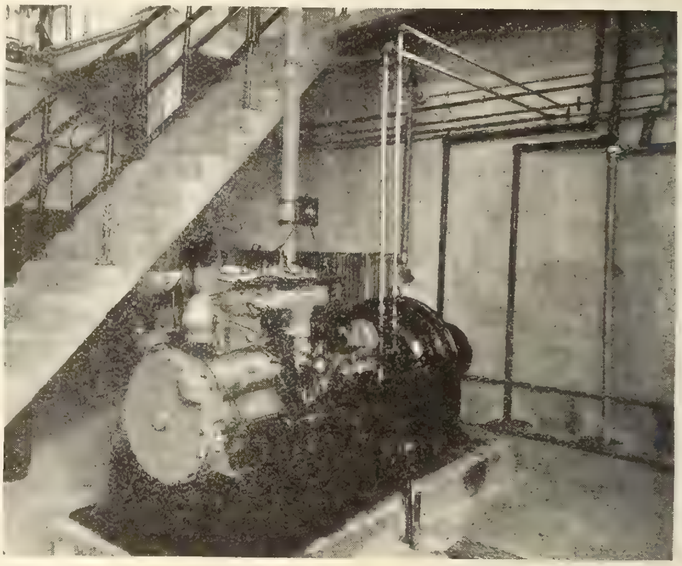
Further particulars on request—50 to 300 H.P. in single units. 600 to 1500 R.P.M.—centrifugal pump and electric generator speeds.



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Used by electricians, plumbers, builders and gasfitters throughout the world.

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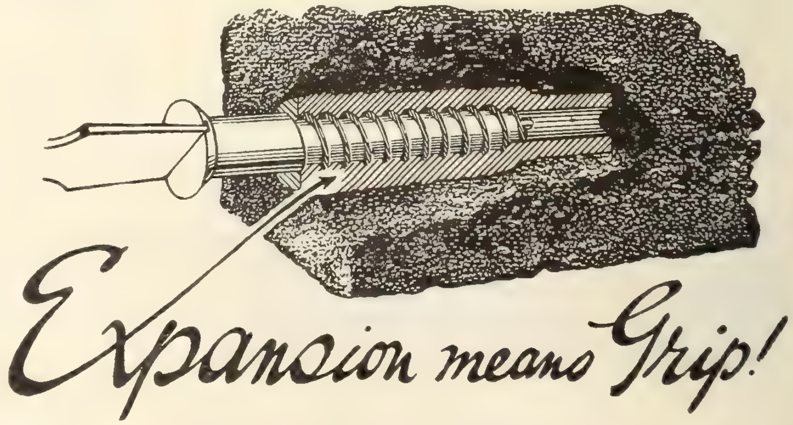
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Item No. 4002— 3	"Pennsylvania" Switching Locomotives—17" x 24" cylinders—Type O-4-O Weight 40 Tons.
Item No. 4003— 2	"Montreal Locomotive Works" Saddle Tank Locomotives—10" x 14" cylinders—Type O-4-O, Weight 18 Tons each—Thoroughly overhauled.
Item No. 4005— 1	"American" Saddle Tank Locomotive—18" x 24" cylinders—Type O-4-O, Weight 57 Tons—Overhauled and reported to be in good operating condition.

— Dump Cars —

Item No. 4008—13	"Western" Air Dump Cars—16 cubic yard capacity—fitted with safety chains.
Item No. 4009—37	"Western" Air Dump Cars—20 cubic yard capacity—fitted with safety chains.
Item No. 4010—15	"Kilbourne & Jacobs" Air Dump Cars—20 cubic yard capacity—fitted with safety chains. All cars thoroughly overhauled—repaired—repainted.

— Steam Shovels —

Item No. 4000— 1	"Atlantic" Standard Steam Shovel—2½ yd. dipper—65 Ton—Class C-45.
Item No. 4001— 1	Model 60 "Marion" Standard Steam Shovel—2½ yd. dipper—70 Ton. Both shovels have been repaired and are in excellent condition.

— Pumps —

Item No. 5000— 5	"Erie" Belt Driven Centrifugal Pumps complete—8" Suction.
Item No. 5002— 2	"Erie" Belt Driven Sand Pumps complete—suitable for 100' head—8 inch.
Item No. 5003— 3	"Erie" Belt Driven Sand Pumps complete—suitable for 40' head—6 inch.
Item No. 5005— 4	"Morris" Centrifugal Pumps 4 inch—direct connected to motors complete.

We can offer Steam pumps of all sizes—suitable for almost all requirements.

You may appreciate that we have available almost everything that might be required on Construction Work—therefore would be glad to have your enquiry. At any rate—put your name on our mailing list for our complete "Sales Inventory"—which will be ready very soon.

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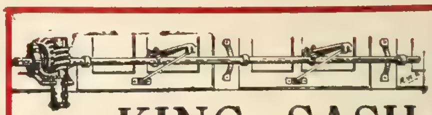

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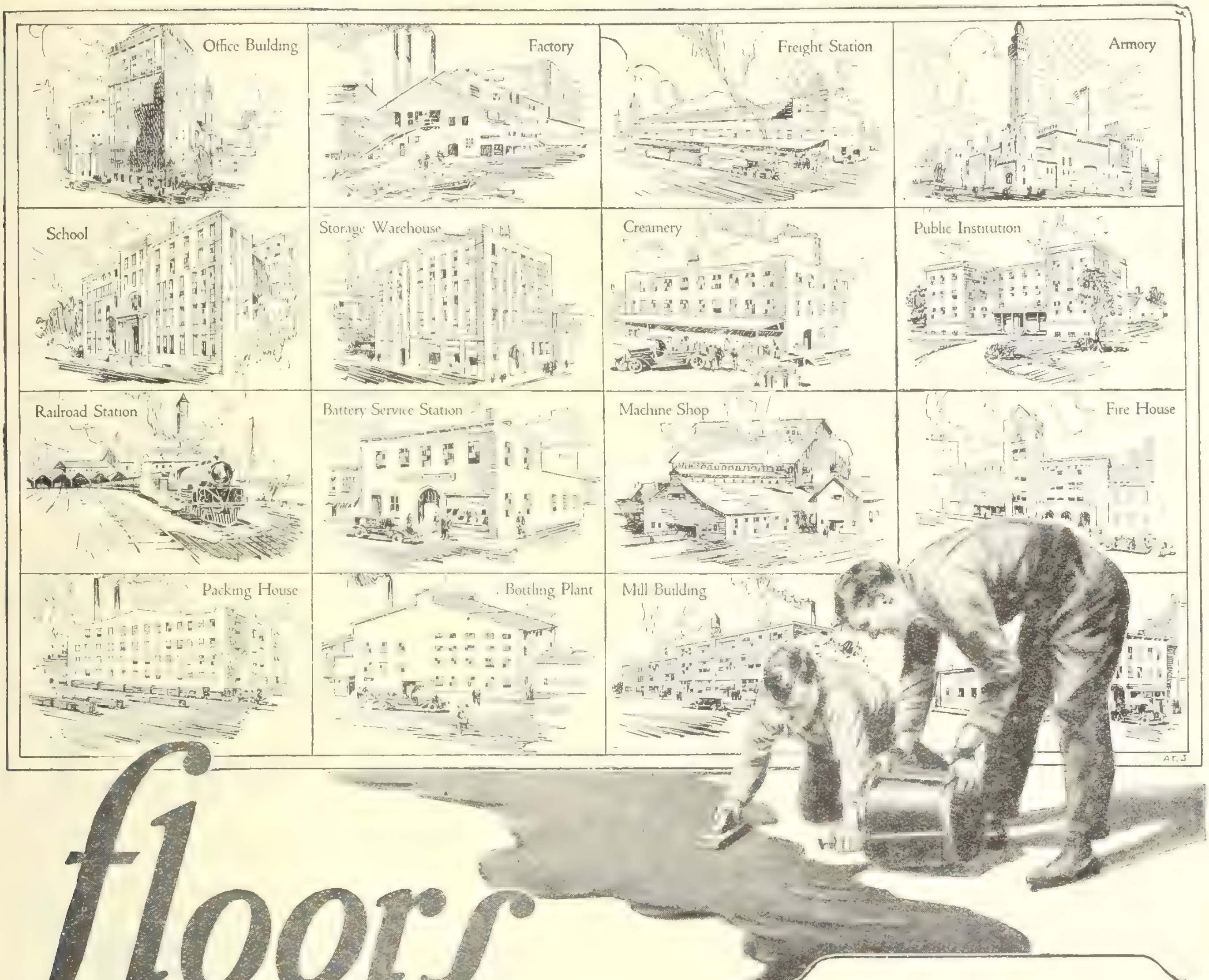
Current Prices of Building and Engineering Materials

		Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.45
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	10.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	25.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	25.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00**	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base	4.00 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.00 "	5.10 base	
Hoops	per 100 lbs.	5.00 "	3.75 "		
Twisted and deformed bars	per 100 lbs.	3.90 "	4.00 "	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	4.00 "	4.00 "	5.35	6.00
Structural shapes	per 100 lbs.	3.90 "	4.25 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.15	6.25
Plates—3/16 in.	per 100 lbs.	4.40 "	4.25 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.50 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.50 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
Cast iron pipe	per ton	65.00 "	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.45	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.80.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.



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Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	94.50	65.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	45.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	135.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	145.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.50	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	70.00
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	15.00	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	14.50
Putty in bulk	per cwt.	5.95	4.25	5.50	6.50
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.43	1.40	1.26	1.56
Raw linseed oil, in bbls.	per gal.	1.40	1.38	1.23	1.53
Turpentine, in bbls.	per gal.	1.75	2.20	2.50	2.80
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	26.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.25	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers (Common)	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Laborers (Skilled)	per hr.	.60-.70			.90
Sheet Metal Workers	per hr.	.80			

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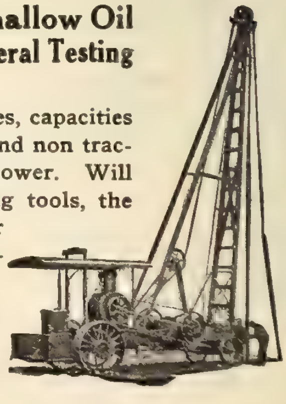

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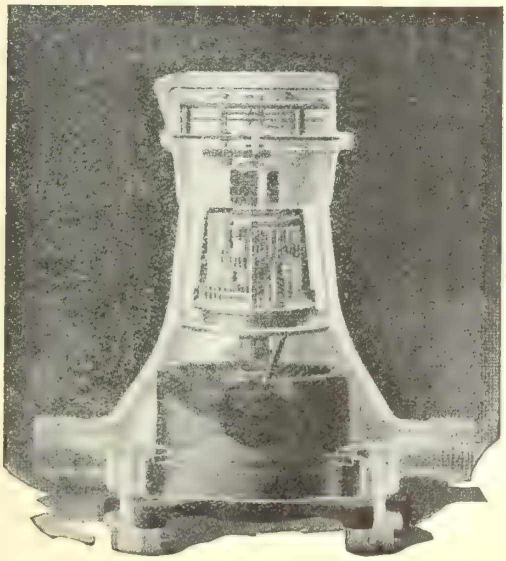

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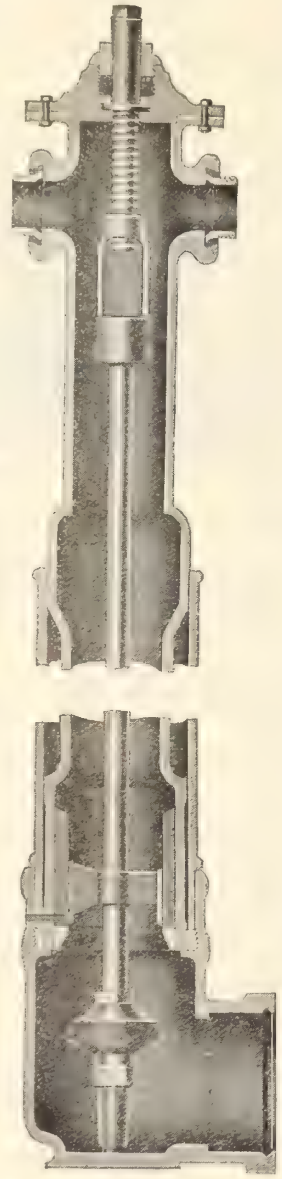

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"Hand Book of Hydraulics," by Horace Williams King. 1st edition published by McGraw-Hill Book Co., Inc. 424 pages. Price $3.50.

"Handbook of Building Construction," by George A. Hool and Nathan C. Johnson. Two volumes, (not sold separately,) 1474 pages, illustrated. Published in 1920 by McGraw-Hill Book Co., Inc. Price $12.00.

"Operation and Maintenance of Irrigation Systems," by S. T. Harding. First edition, published in 1917 by the McGraw-Hill Book Co., Inc. 271 pages, illustrated. Price $2.50.

"Practical Road Building," by Charles E. Foote. Just published by David McKay, 295 pages, illustrated. Price $1.50.

"Relief from Floods." The Fundamentals of Flood Prevention, Flood Protection and the means of determining proper remedies. By John W. Alvord and Charles B. Burdock. First edition published in 1918 by McGraw-Hill Book Co., Inc. 175 pages, illustrated. Price $2.00.

"Sheet-Metal Pattern Drafting and Shop Problems," by James S. Daugherty. Published in 1922 by The Manual Arts Press, 173 pages, illustrated. Price $2.50.

"Steel Bridge Designing," by Melville B. Wells, C.E. Published by Myron C. Clark Publishing Company in 1913. 260 pages, illustrated. Price $2.00.

"The Engineering Index for 1920," recently published by the American Society of Mechanical Engineers, 586 pages, price $6.00.

"Use of Water in Irrigation," by Samuel Fortier. Published in 1915 by McGraw-Hill Book Company. 265 pages, illustrated. Price $2.00.

"Use of Water in Irrigation," by Samuel Fortier. Second edition. Published by McGraw-Hill Book Company, 1916. 325 pages, illustrated. Price $2.50.

"Water Purification," by Joseph Ellms. Published in 1917 by McGraw-Hill Book Company. 485 pages, illustrated. Price $5.00.

"Collected Papers On Acoustics," by Wallace Clement Sabine just published by the Harvard University Press. Price $4.00. 280 pages, illustrated.

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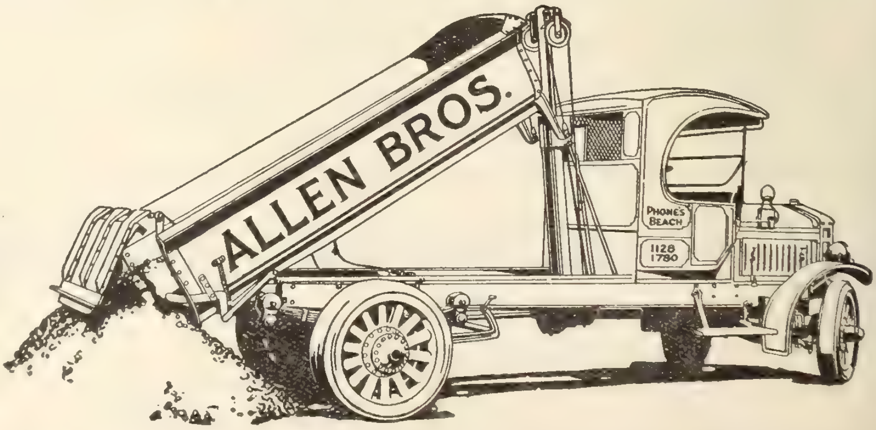

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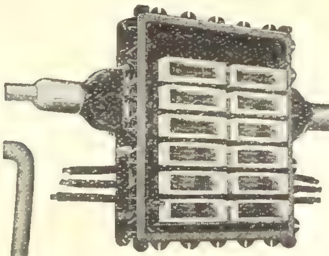

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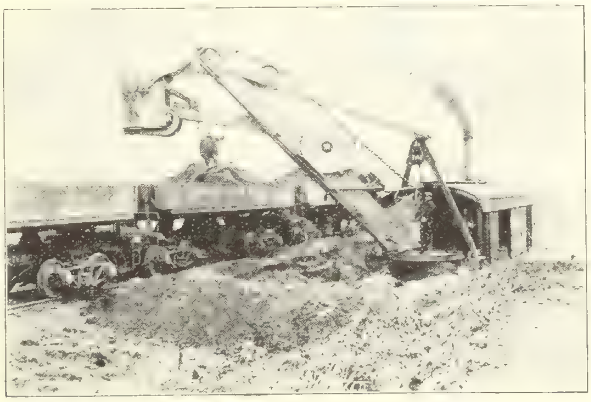

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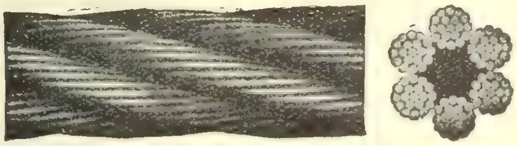

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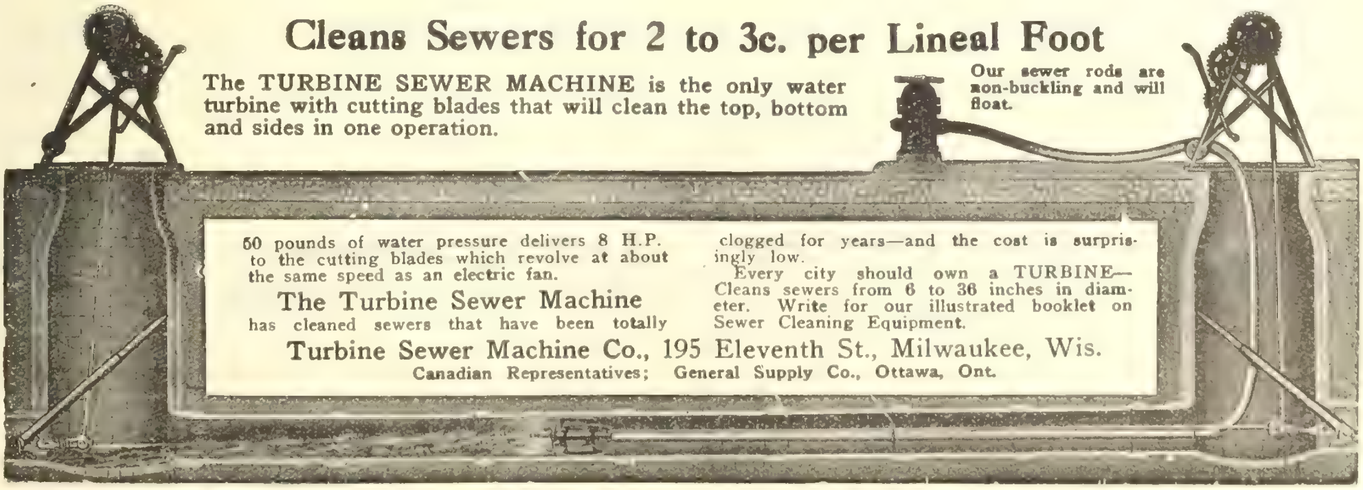

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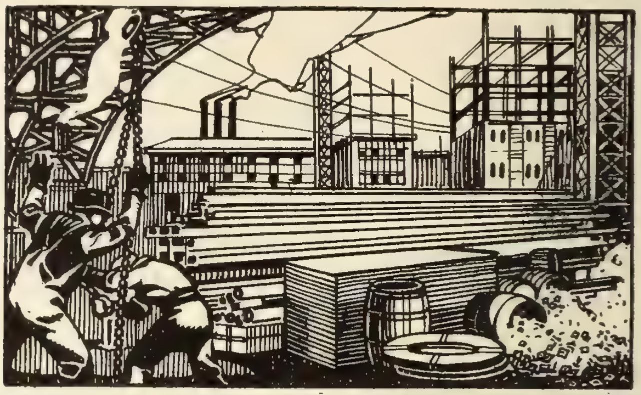

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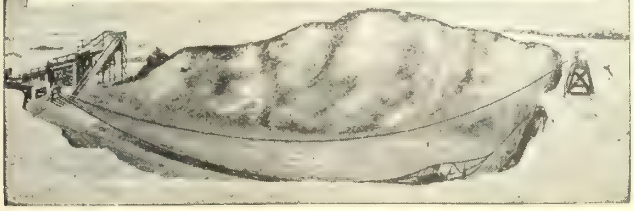

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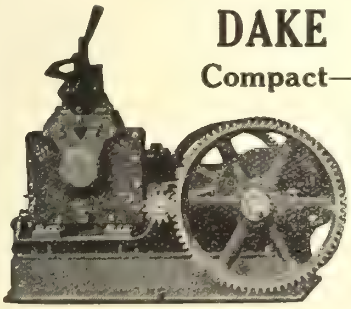

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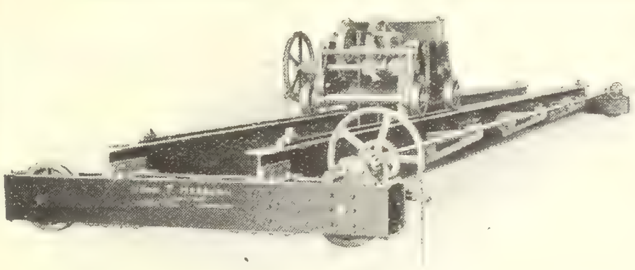

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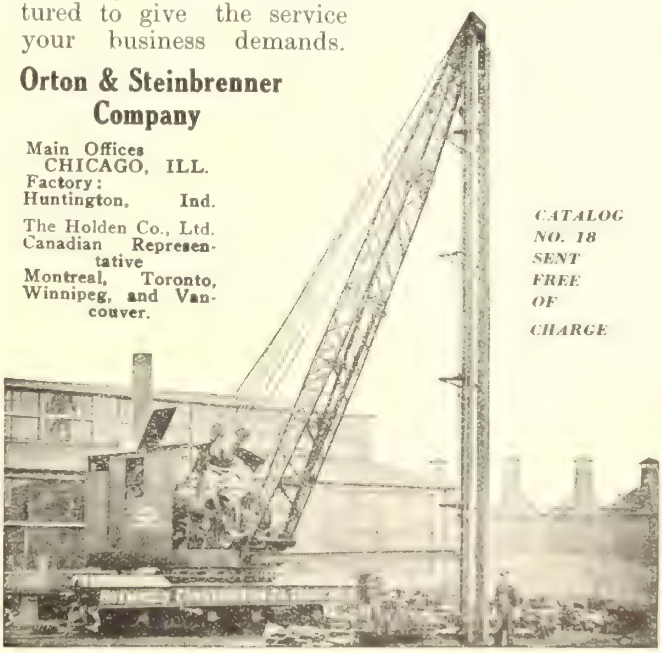

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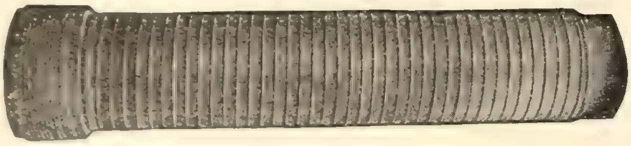

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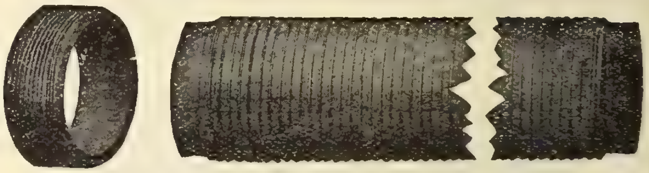

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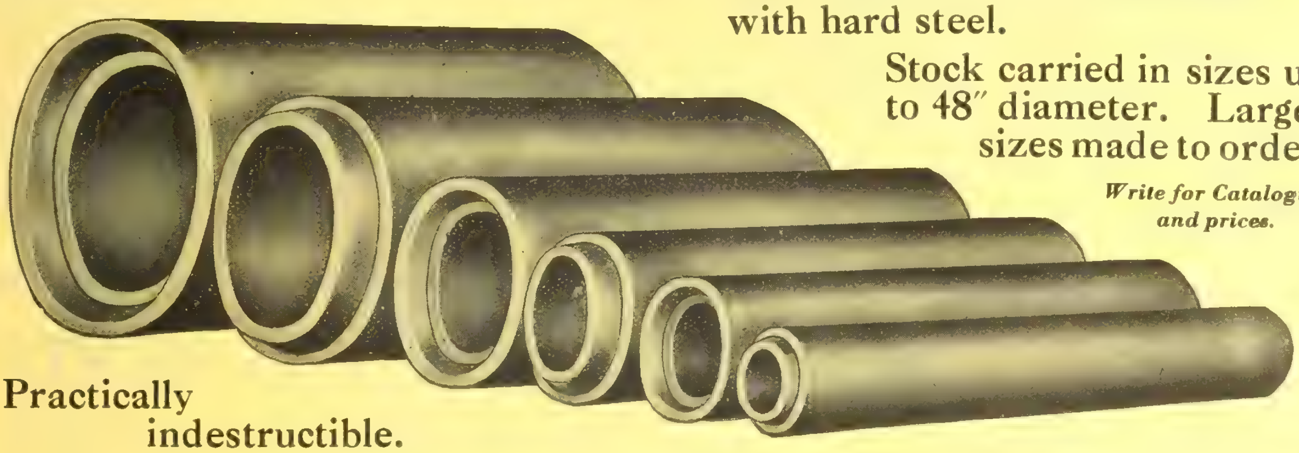

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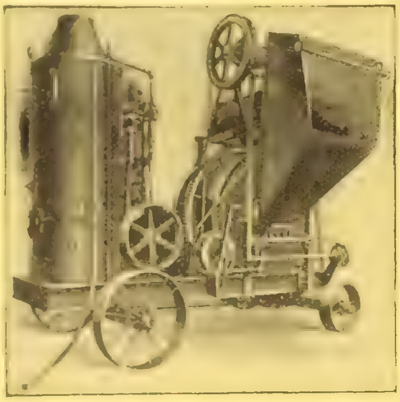

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Vol. 37 Toronto, June 13, 1923 No 24

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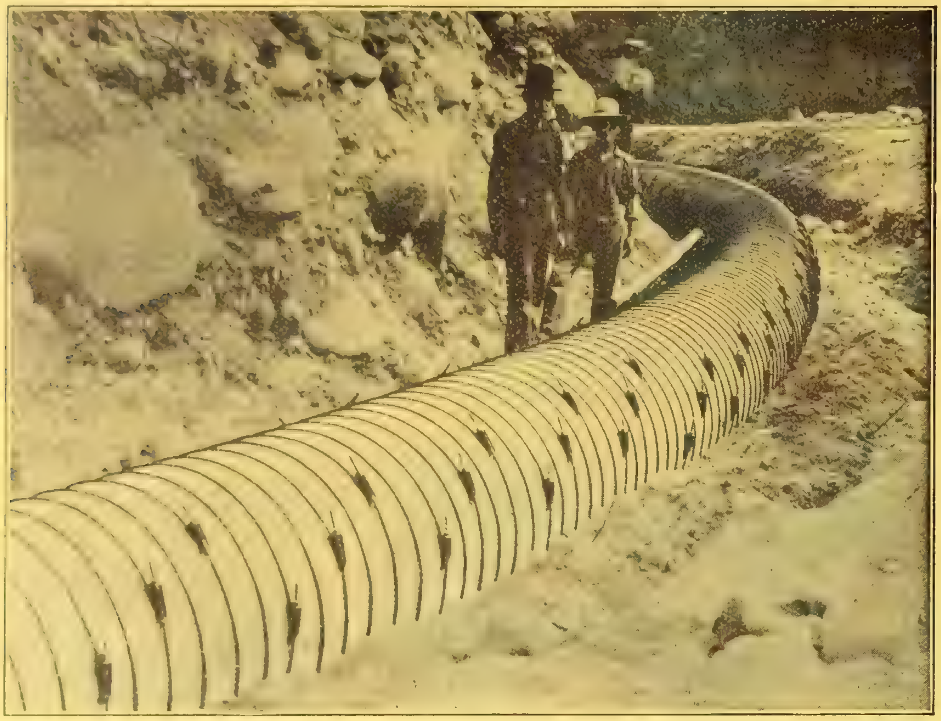

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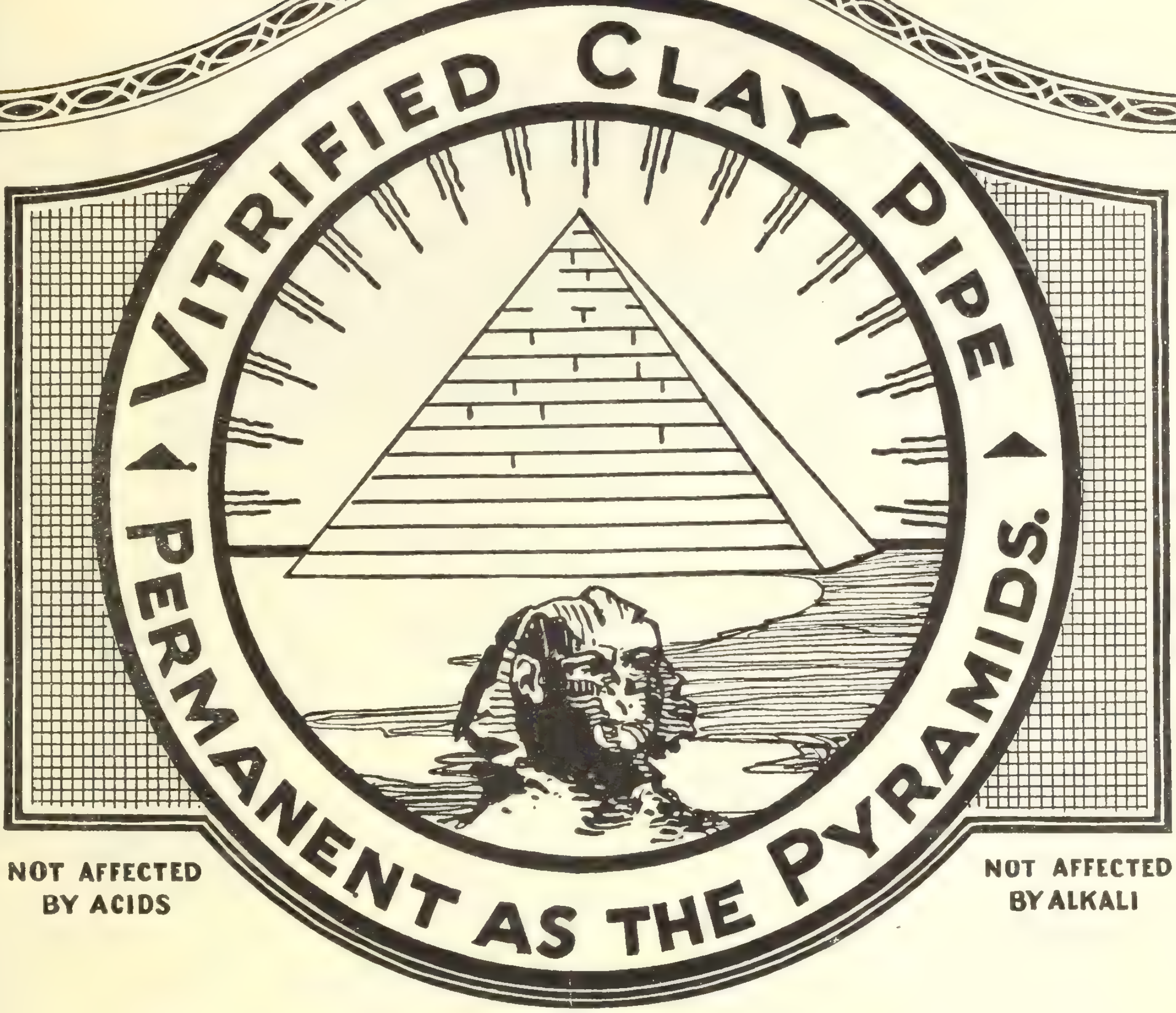
Canadian Pipe Company, Ltd.

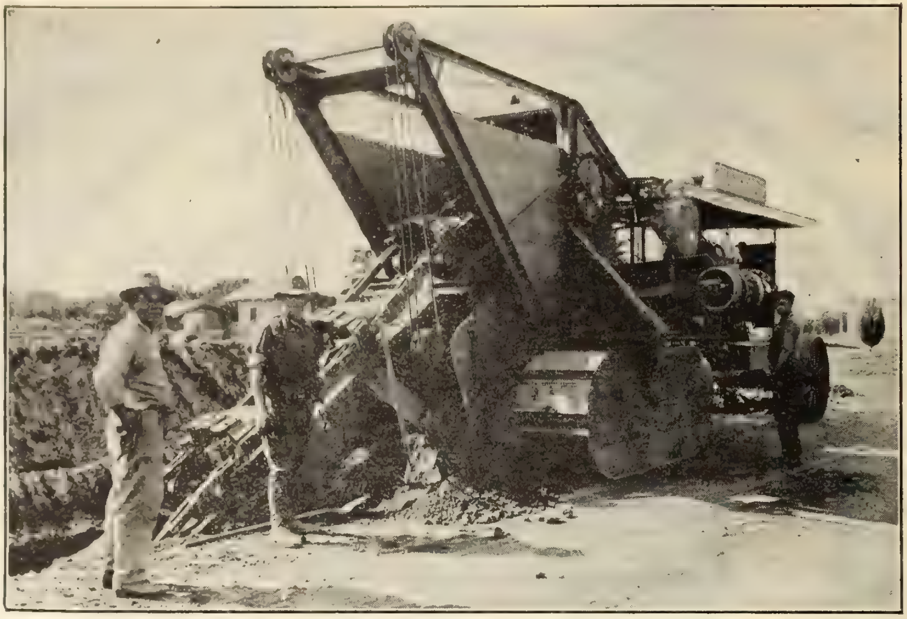
550 Pacific St., VANCOUVER, B. C.



"There is nothing like leather" is the slogan of the tanner. You probably endorse it because you stand on leather though many substitutes have been offered and tried. Those that have tried, and tested by time, substitute materials for Vitrified Clay Pipe, stand firmest for clay and will endorse the slogan "There is nothing like Vitrified Clay Pipe".

Vitrified Clay Pipe
Publicity Bureau

Toronto, Ontario. St. Johns, P.Q. New Glasgow, N.S.

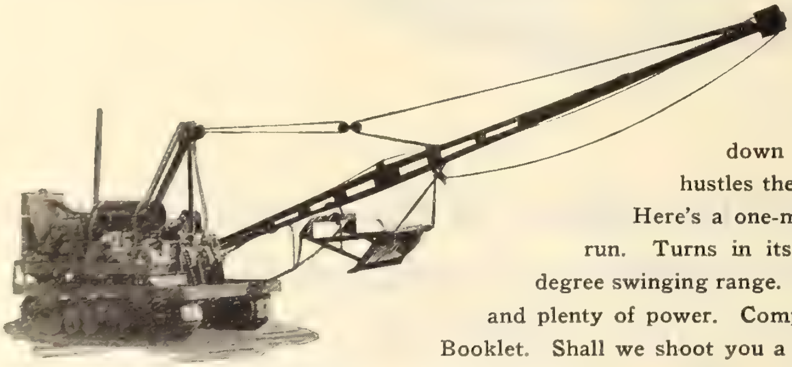


It's a *Comfortable* Sort of Feeling

Makes you feel kinda good to know that the company you've bought a machine from is going to take care of you. Here's a contractor way out in Los Angeles—Harper D. Churchill. He writes us:

"I chose a Buckeye after carefully checking their performance and specifications. At this instance, I wish to go on record that the Buckeye organization is the squarest and easiest to do business with that I know of. Your wants are taken care of promptly and efficiently. They make you feel as though they are interested in your welfare. This alone would make us give them all our future business."

That's putting it pretty "strong." But you'll find most Buckeye owners strong for Buckeyes and the service that goes with 'em. Put a Buckeye on your next job—you'll find we're right when we say "you'll always be glad you bought a Buckeye."



Going Down!

Cost of back-filling going down when a Buckeye Back-Filler hustles the dirt back where it came from. Here's a one-man machine that one man can run. Turns in its own length. Boom has 160 degree swinging range. Full length multiplane traction and plenty of power. Complete details in the Back-Filler Booklet. Shall we shoot you a copy—today?

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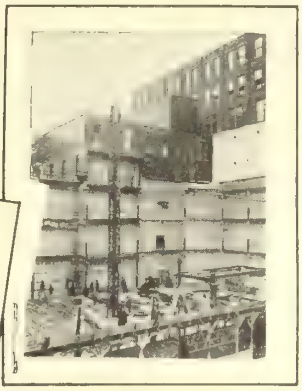
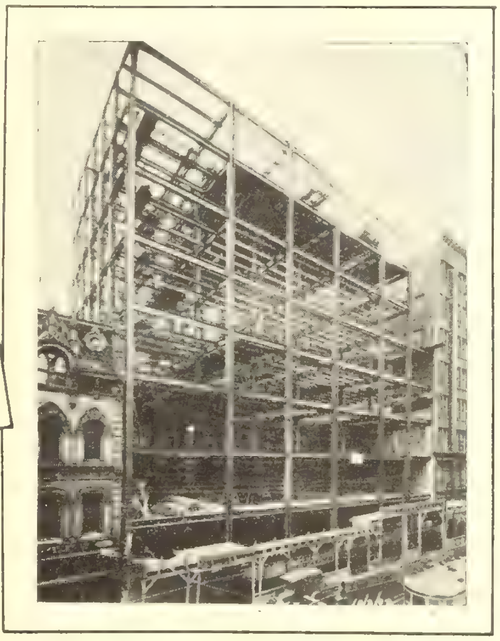
Buckeye ✓

ERECTED in 17 DAYS

Framework of Structural Steel

New Building
for
THE T. EATON C^O LIMITED
TORONTO - CANADA





The above illustrations indicate the erection of the steel framework of one section of the new buildings being erected for the T. Eaton Co., Limited, on Yonge Street, Toronto. This constitutes a record for the rapid erection of structural steel.

BUILD WITH
STRUCTURAL STEEL

Issued by the
Structural Steel Association

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(Continued on page 8)

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Engineers, Manufacturers
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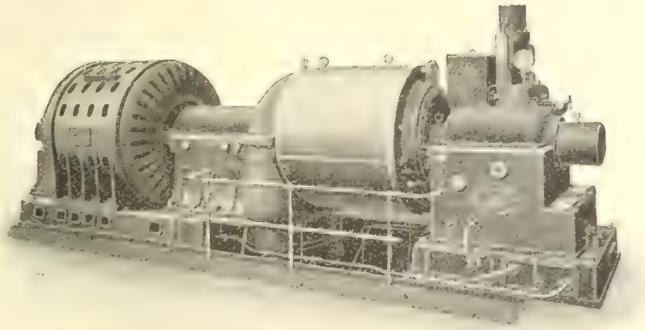
We carry a large stock of Structural Shapes and plates and can make prompt shipment on orders for plain material.



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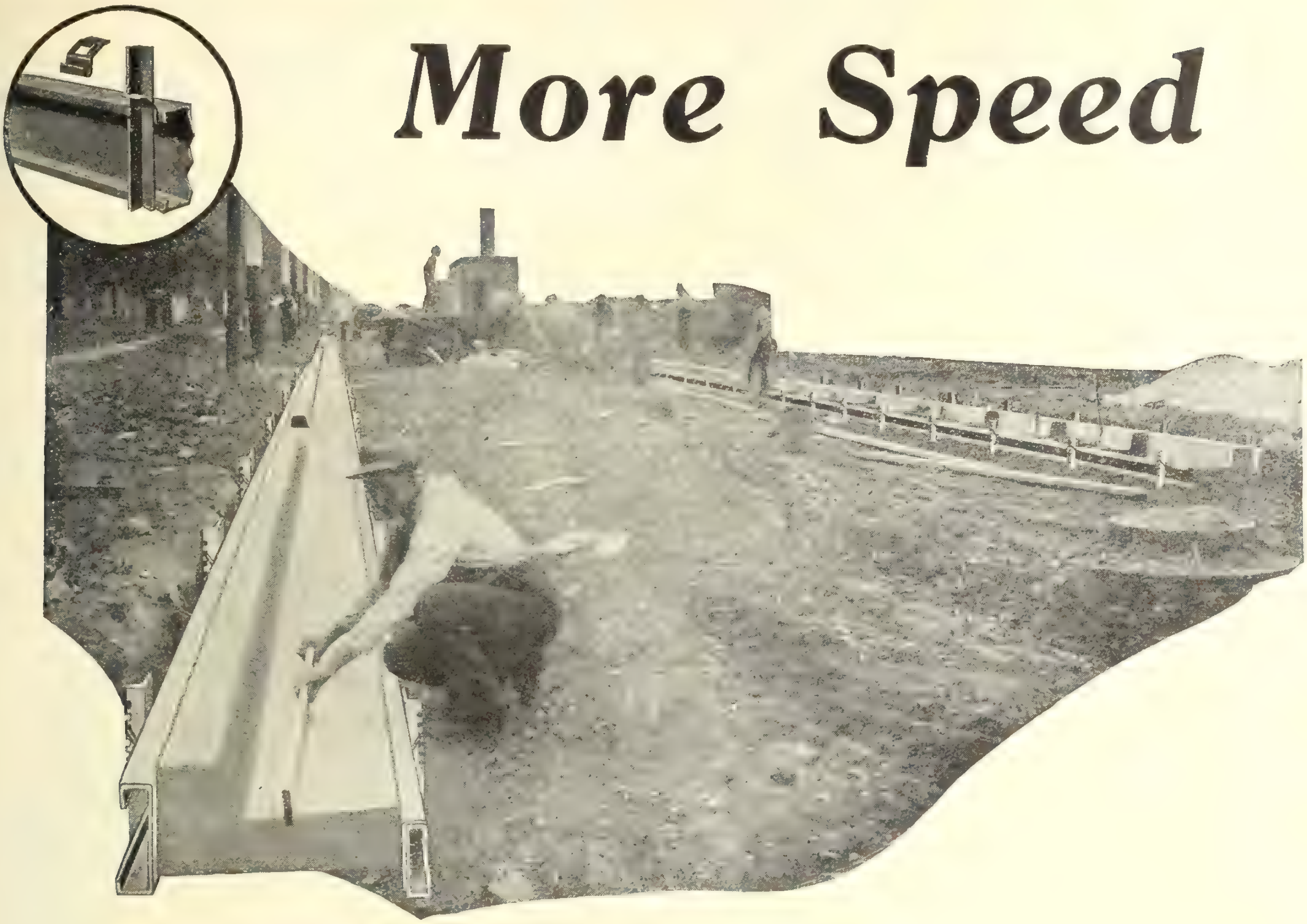
More Speed



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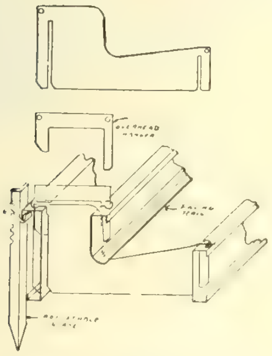

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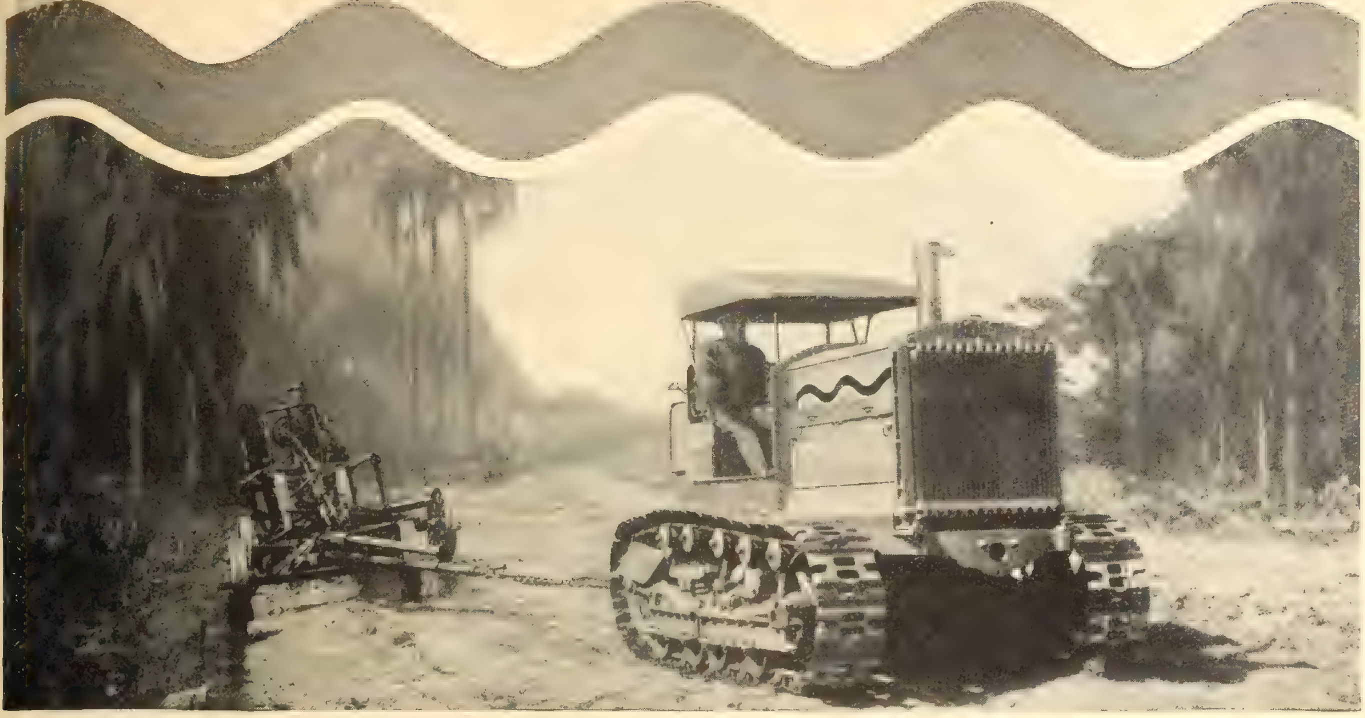

Conquering the Everglades

Through the very heart of the Florida Everglades, world-famed as an impenetrable swamp, indomitable road-makers are now pushing the Tamiami Trail. Starting from Tampa on the Gulf, this 250-mile motor highway will run southward to Marco and then swing fearlessly into the Everglades, terminating at the magic city of Miami.

The boards of trade of Tampa and other cities, the Tamiami Trail association, county officials, citrus growers and other interests along the route are keenly concerned in the early completion of this trail at lowest possible cost. That's why "Caterpillars"* are indispensable on this job. Mr. C. T. Friend, chairman of the county commissioners at Tampa, says: "Our third "Caterpillar" is now at work grading the Hillsborough County end of the Tamiami Trail. From the standpoint of upkeep, service and general satisfaction, we feel our investment in these remarkable machines has been a mighty good one."

"Caterpillars" alone have the traction demanded for uninterrupted operation over the sandy, boggy places and difficult terrain encountered. Their superior speed and endurance means, too, that this highway *is* being completed in the shortest time and at the lowest possible cost. Our booklet, *"Caterpillar" Performance,* will be sent upon request. Write for it today.

**There is but one "Caterpillar"—Holt builds it*

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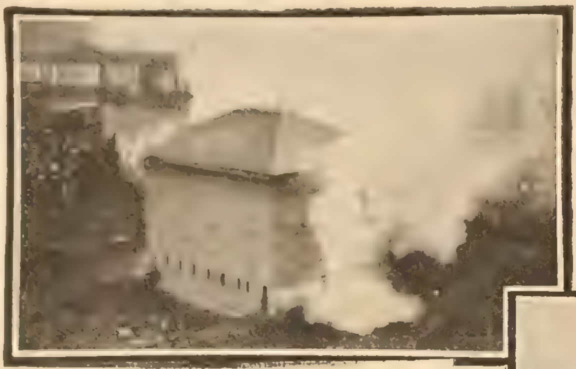
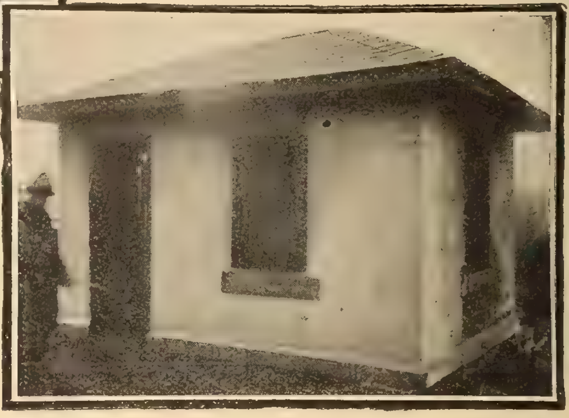


Concrete Block Building as it appeared 20 minutes after fire was lighted. Water being applied



Appearance of Concrete Block Building after fire was completely extinguished

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CONCRETE
FOR PERMANENCE

Concrete Materials Put to a Supreme Fire Test

An interesting demonstration of fire-proof home construction was arranged by the Concrete Products Association of Minnesota.

A house was built of Concrete Block, with Cement Stucco surface, Cement Asbestos Shingles, and Concrete Sills and Lintels.

This building, filled with highly inflammable material, was set on fire, and the fire permitted to rage thirty minutes.

Although the fire was extinguished by a heavy stream of cold water applied to the intensely hot walls, close inspection of the interior disclosed the fact that not a single crack was in evidence in either the Block, or Concrete Sills and Lintels. The only parts of the building damaged at all were the Doors and Window Frames of wood.

This test, and its remarkable result, serves to emphasize the sound structural qualities of Concrete Block Stuccoed. The Concrete Block gives strength and permanence. The Stucco lends beauty and charm, in addition to being weather-proof, fire-proof and rot-proof.

When it is considered that the walls of this fire-tested dwelling were only ten days old, and the Stucco and Plaster only three days old, the results of the demonstration are truly significant.

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These Indicator Posts function satisfactorily and will stand the strain of severe usage so detrimental to inferior equipment.

When ordering be sure and specify depth of trench.

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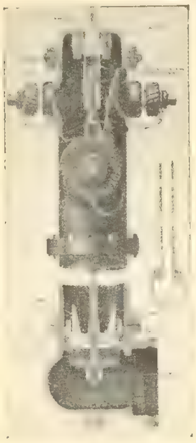

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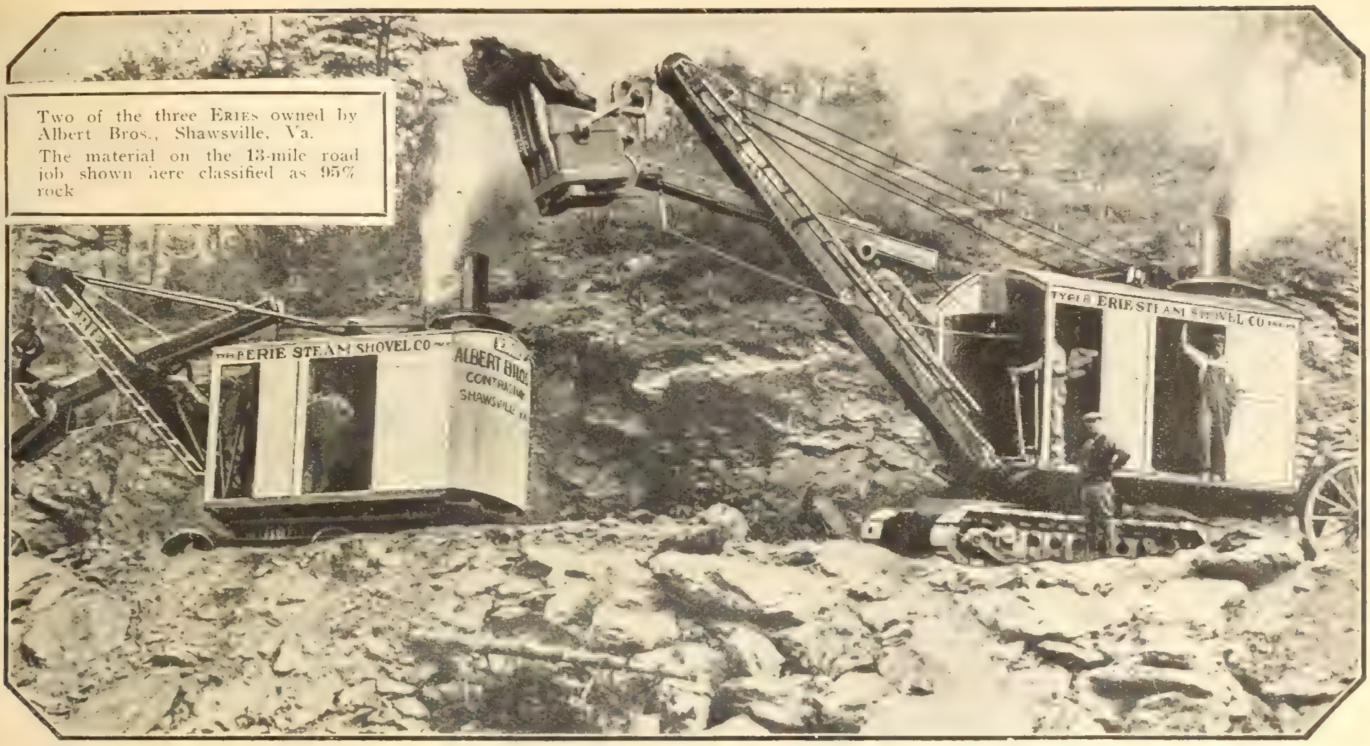
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ALBERT BROS. CONTRACTORS SHAWSVILLE VA
TYPE ERIE STEAM SHOVEL CO

Two of the three Eries owned by Albert Bros., Shawsville, Va.
The material on the 13-mile road job shown here classified as 95% rock

"To be sure of steady service, buy an Erie!"—you hear it everywhere

These are just a few examples of *hundreds* of letters written by ERIE owners:

"The Erie has fewer breakdowns than any other shovel made. In two years' operation I haven't spent $10 for repairs. The Erie gives us 400 to 500 cu. yds. per day in heavy grading, and it only takes us about 3 hours to change over to a crane and unload 6 to 10 cars of material per day."— **C. G. Fuller, Canal Dover, Ohio.**

"In 8 months, we have moved our caterpillar type Erie 70 miles, and it hasn't cost a nickel for repairs. During the past 10 years I have had experience with most makes of shovels. When I went into business for myself I bought an Erie, as I am convinced from practical experience that it is the best shovel to own."— **Fred. J. Hines, Pres., Hines-McCabe, Inc., Rochester, N.Y.**

"Our Eries have been excavating for buildings for more than 8 months, sometimes nearly all rock, and we have spent nothing for repairs. We get anywhere from 400 to 800 cu. yds. per day from each. I have run practically every known make of steam shovel, and I have not seen one that can compare with the Erie."— **E. W. Cronin, Cronin & Driscoll, Roxbury, Mass.** (Own 2 Eries.)

"The Erie cannot be compared to any other machine that I have seen or used. Before purchasing my Erie I owned another shovel which I had to sell because of its extremely high upkeep cost. Grading roads and digging sewers with my Erie for a year and a half, my repair cost has been only $9.00."— **C. A. Johnson, Virginia, Minn.**

(We can send you many more such letters from ERIE owners all over the country)

Type "B" Erie Crane loading stone, and sand from storage piles to measuring bins. Owned by Fort Pitt Construction Co., Pittsburgh, Pa.

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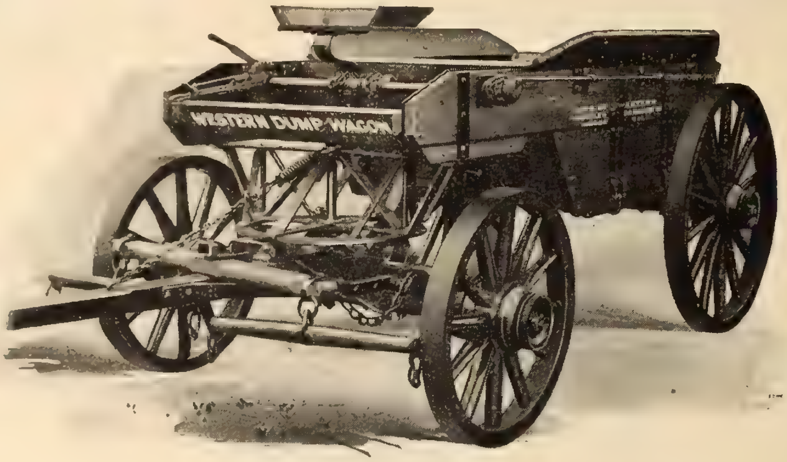

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30·B

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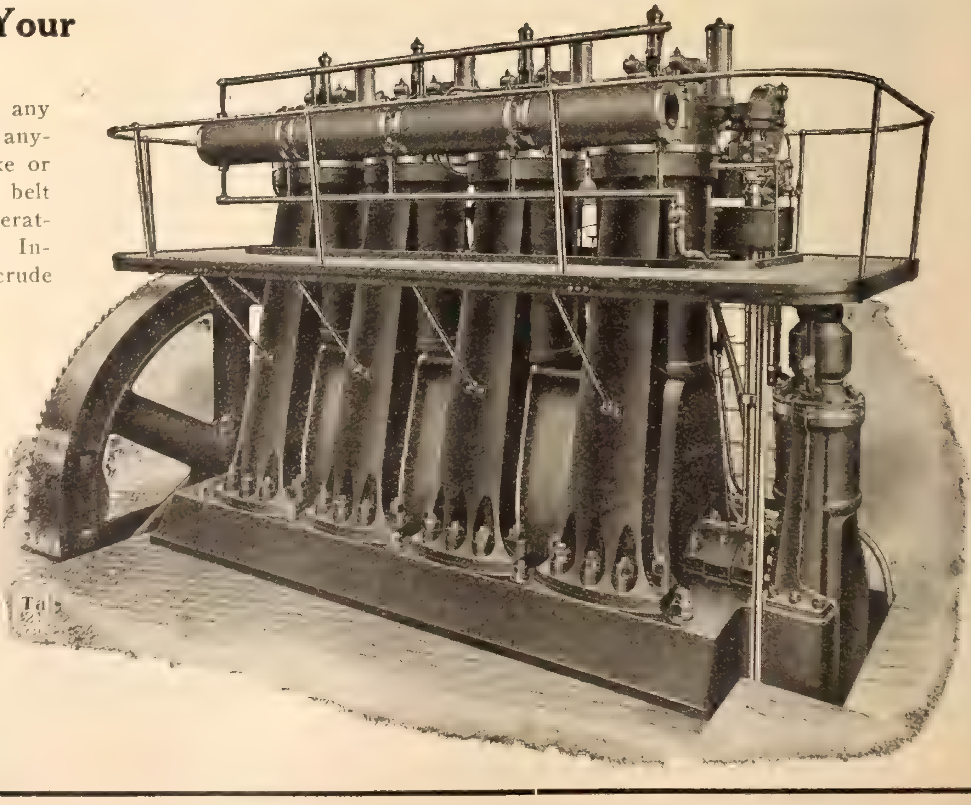

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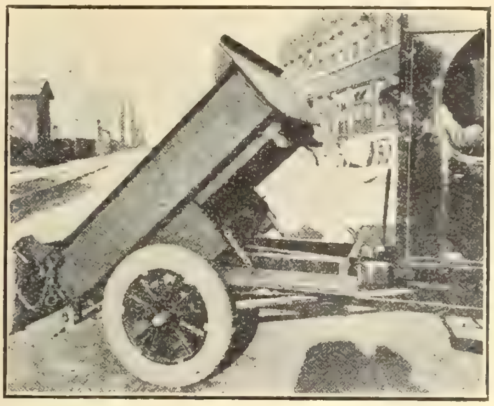
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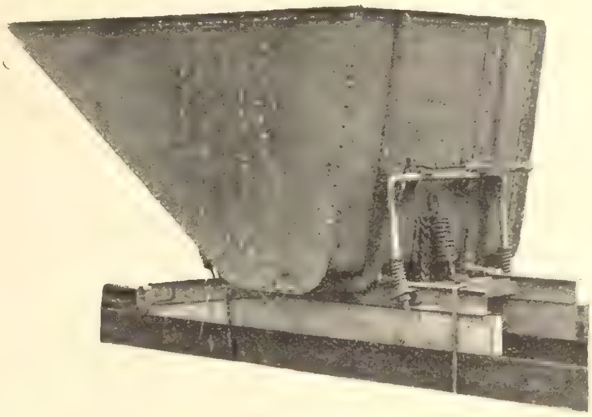
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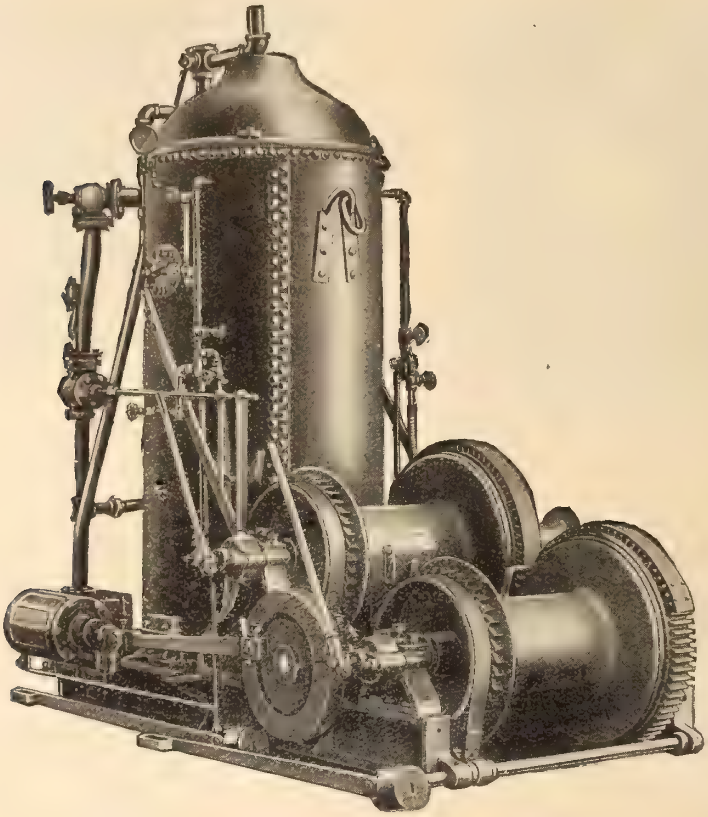

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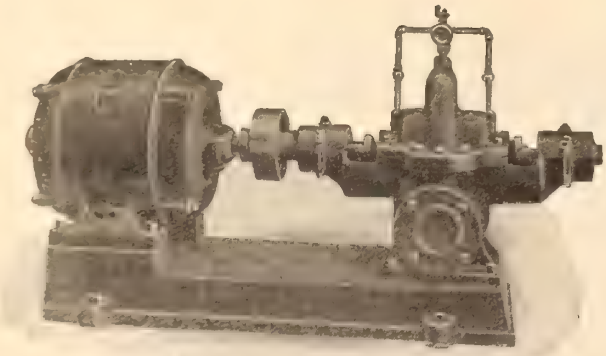

W 243

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Present Building Activity Likely to Continue Many Months

That building construction throughout Canada is now showing greater activity than at any time since the boom days of a decade ago, is how MacLean Building Reports, Ltd., analyzes the present situation. According to them contracts actually awarded during the first months of this year amount to $114,648,400, compared with $96,831,600 in 1922, and $85,326,700 in 1921. Ontario leads with a total of $62,871,900; Quebec second with $32,795,000; the Western provinces, $16,337,500, and the Maritimes, $2,644,000. Building in Quebec shows marked activity, Ontario and British Columbia are ahead of last year, while the Prairies and Maritimes seem to languish.

During May, construction contracts awarded in Canada amounted to $40,697,200, compared with $34,827,300 a year ago. This is the largest May total since 1913. Residential building accounted for 36.6% of the May total and amounted to $14,897,100. Business building amounted to $8,555,000, 21.1%; industrial buildings, $3,763,700, or 9.2%; public works and utilities, $13,481,400, or 33.1%. The value of contemplated new work reported during May was $51,550,400.

The recent accelerated pace of building construction is said by MacLean Building Reports to be natural and logical. The shortages of building during the war and post-war period is now being made up. In addition there is a well-defined movement of city-dwellers towards the suburbs. With these two influences operating together, it is not surprising that there has been such a tremendous demand for new construction.

Building on the outskirts of Montreal, Vancouver and many cities in Ontario continues very active. Most of the suburban building is residential—moderate-priced homes for owners' occupation. The increasing popularity of the automobile has caused a pronounced trend towards the suburbs which far-seeing men believe is only begun. It is apparent that it will take a good many years to satisfy the present potential demand for suburban dwellings. It would seem that the present prosperity in the building field is sound in nature and will endure over a considerable period—not at the present rate, but in volume sufficient to satisfy the industry.

Building activity in the United States is being hampered by a rapid and unjustified increase in material and labor costs. By way of contrast, building material prices in Canada have advanced less than 12% from the low of last year. In the main conditions throughout the Dominion are satisfactory. Industry is extending its operations and showing a gradually widening margin of profit—there is little or no unemployment and a particularly easy money situation prevails.

Steel Production Showing Increase

Production of steel ingots and castings made a further advance in April above the high level of the previous month, and reached a total of 92,598 tons in the month under review, representing an increase of 3,510 tons, or 3.9 per cent., according to a report just issued by the Dominion Bureau of Statistics. The output in April of last year was 21,935 tons, while in April, 1920, the production was 92,480 tons. It is also noteworthy that the April output this year was greater than in any month since November, 1920, when the production was 97,120 tons. The monthly average for April during the period from 1919 to 1921 was about 65,000 tons.

The cumulative production for the first four months of the present year was 276,184 tons, as compared with an output of 176,036 tons in the first four months of 1922 and 127,275 tons in the corresponding period of 1921. The cumulative output during the first four months of 1920 was 365,678 tons.

The output of steel ingots for further use of the reporting plants increased from 85,393 tons in March to 88,649 tons in April. Direct steel castings increased to 3,949 tons, the highest monthly record for the last two years. The production in March last was 3,995 tons.

The output of pig iron during April amounting to 83,877 tons, was in advance of all monthly records since November, 1920, when 93,525 tons was produced. The April production was 28.5 per cent. greater than the output of March, reported as 65,297 tons. The advance over the corresponding month of last year was 51,305 tons or 157.5 per cent.

The output in April, also exceeded by 26.1 per cent. the average for the corresponding month during the three-year period from 1919 to 1921, computed as 66,530 tons. The cumulative production for the first four months of the present year was 67.2 per cent. greater than for the corresponding period of 1922, and 18.1 per cent. greater than the comparative amount for 1921. The quantities were 234,163 tons in the four months ending April, 1923, 140,061 tons during the same months of 1922, and 198,303 tons in the corresponding period of 1921. The cumulative output of the present year to date, however, was less than the comparative figure for 1920 given as 282,978 tons.

The reports of the city manager and the city auditor of Chatham, Ont., for the year 1922 have recently been published. In them are contained detailed financial statements covering the various municipal activities coming within the jurisdiction of the city engineer and manager, C. H. R. Fuller.

Dominion Engineering Works Operating to Capacity

Dominion Engineering Works Limited, Lachine, P. Q., is working to capacity in its three departments, hydraulic machinery, paper making machinery and miscellaneous. Four 11,300 h.p. turbines are being built for Montreal Light, Heat and Power Company, three 58,000 h.p. I. P. Morris turbines for the Hydro-electric Power Commission of Ontario, one 11,000 h.p. unit for Price Bros., Chicoutimi Mills; one 5,000 h.p. unit for Granby Consolidated Mining, Smelter and Power Company at Anyox, B. C., four 30,000 h.p. units for Shawinigan Engineering Company, Limited, at LaGabelle, Que., four 42 by 30 Larner-Johnson valves for Northern Ontario Light and Power Company, two 1,500 h.p. exciter units for Montreal Light, Heat and Power Company, Limited, plant at Cedars, Que.; four 3,300 h.p. units for Northern Ontario Light and Power Company; two 7,500 h.p. units for East Kootenay Power Company, Limited at Elko, B. C., and three 192 by 120 Larner-Johnson valves for Ontario Hydro-electric Power Commission.

One 230 in. newsprint paper making machine for Belgo Paper Co., also a 234 in. newsprint paper machine for Backus-Brooks Co., also some paper reels for Spanish River; rubber masticators for Farrell Foundry and sintering machine for Mond Nickle Co. are other items going through the works.

The Week's Developments in a Nutshell

In spite of an undoubted slowing up of construction work in the United States all reports indicate that shipments of materials are keeping up. For example, last week's loadings on the railways were over a million cars which is a record figure outside of the grain moving season. The May production of iron was 124,784 tons, also the highest on record. These heavy shipments may be explained in part as merely due to orders previously given but they indicate that a very heavy program is still being carried along. Caution signals are being constantly displayed and it may be that the situation will be kept in hand and a bad depression avoided.

In Canada there has been no apparent change during the week which means, we believe, that the situation is improving. Industrials, judged by the stock market, which is generally a pretty fair indication, are at least holding their own. We are blessed with two very important industries—mining and pulp—that show increasing activity. The big event in the financial world was the eight million dollar bond issue of the Belgo Paper Co., which has now been turned into an entirely Canadian Company. This issue, at last reports, is being taken up rapidly. In the mining field the increasing activity is indicated by the announcement of the placing in operation of the first unit of the Great Northern Power Company's plant at Indian Chutes—to which two more units will be added immediately due to insistent demand for power. The decision of the Hollinger interests to develop "Portage Place" on the Abitibi has been followed by the taking of tenders for construction and equipment and work on a 30,000 h.p. development will begin immediately.

Another encouraging feature is the splendid condition of crops all over Canada. This may suggest the possibility of continued low prices for farm products but, after all, nothing is better calculated to help the "morale" of the country at large than a bountiful harvest.

It is a further encouraging sign that the electric traction companies seem to be working back to normal. The event of the week in this direction was the replacing of the dividend of the Twin City Rapid Transit Company on the old basis that prevailed before the war. The management of this company has a continental reputation for conservatism and this latest move can only be interpreted as indicative of their executive's confidence that the future is safe.

The one disappointing feature is the consistent report from the retail trades that business is slow. This undoubtedly is the result of abnormal weather rather than lack of buying ability. There is no unemployment in Canada to speak of, and this being the case, we have the assurance that the retail buying is merely deferred or that the people are getting back to their old ideas of thrift. Either interpretation augurs well for the future.

Construction activites at the Grand Discharge, Lake St. John, P.Q.—a downstream view of the cofferdam

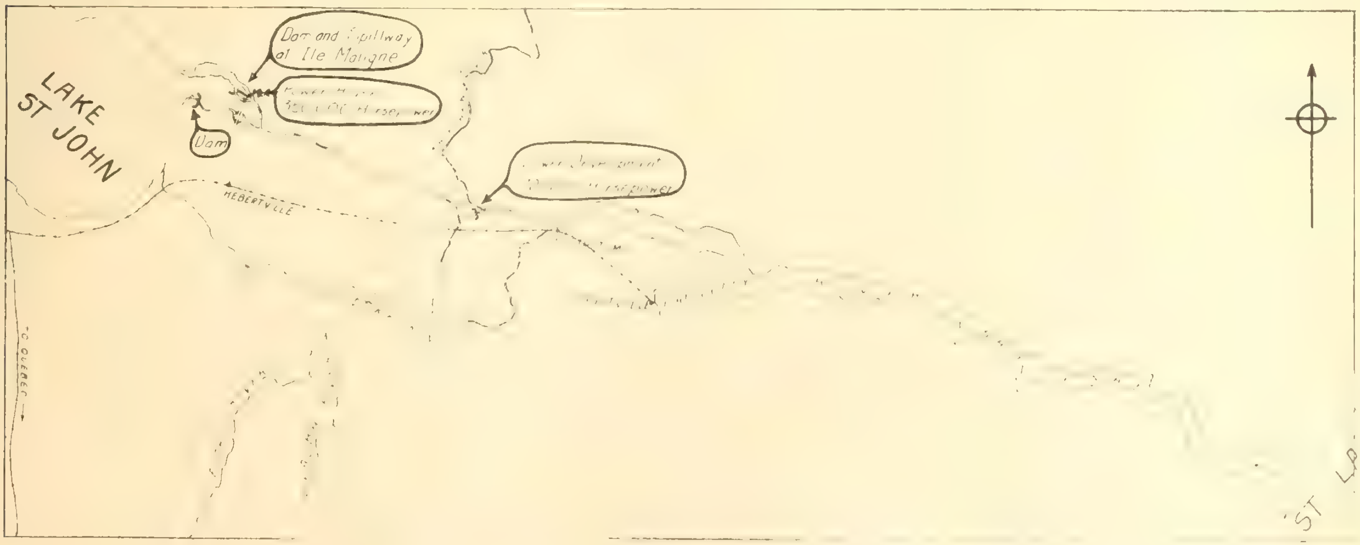
The Backwoods of Quebec Now Alive with Construction Activities

The Quebec Development Company Have Made Tremendous Progress with Their Scheme of Utilizing the Upper Saguenay River—The First Pictures from the Site of the Work

Considerable progress has been made on the work which is being undertaken by the Quebec Development Co., to develop the tremendous power available on the Saguenay River at the Grand Discharge from Lake St. John. In previous issues of Contract Record there have appeared maps showing the location of this site accompanied by short descriptions of the size and nature of the work and the plans for developing the power that is available there.

A brief description here may serve as a summary of what has been said in other issues. The site of the dam is about 25 miles above Chicoutimi, which in turn is about 70 miles from the St. Lawrence River. Lake St. John, which is a big lake, is about 5 miles above the site. The water flows out of Lake St. John by two routes called the Grand Discharge and the Little Discharge, an island called Ile d'Alma separating the two channels. It is the intention of the Quebec Development Co. to place a dam across the Grand Discharge channel at a favorable point near the lower end of Ile Maligne, about 5 miles from the lake. The other channel, called Little Discharge, will also be dammed in order to divert the water into the bigger channel where the power house will be located. It is intended to develop about 390,000 h.p. at this site by means of twelve 30,000 kv.a. units which are to be installed by the Canadian Allis Chalmers Co., and the Canadian Westinghouse Co.

The magnitude of the enterprise demanded fairly extensive preliminary preparations which have been under way for some time. The most important work, apart from the preparations at the site, has been the construction of about 12 miles of railway line through very difficult country. This will be of standard gauge and has been constructed in a most up-to-date way involving heavy rock cuts and adjoining fills as well as three large truss bridges and one long trestle bridge. The railway line will connect at Herbertville



The locations of the works involved in the Quebec Development Co's. project

A general view of the Ile Maligne showing both northerly and southerly channels of the Grand Discharge

with a branch of the Canadian National Railway running from Quebec to Lake St. John.

The cut and fill part and general work is being done by Gagnon and Gagnon, railway contractors, under the direction of their resident manager. All foundations and piers for bridges and trestles were done by Wm. I. Bishop, Ltd., contractors, of Montreal and involved the placing of considerable concrete work under the most trying conditions. It is interesting to note that this part of the work has been successfully completed and now awaits the steel work. Mr. Bishop himself is the consulting engineer for the company.

The steel work for the three truss bridges is being fabricated by the Canadian Bridge Co., at Walkerville, Ont., and is ready to ship as soon as notification is received. There are about 1,200 tons of steel in these three bridges.

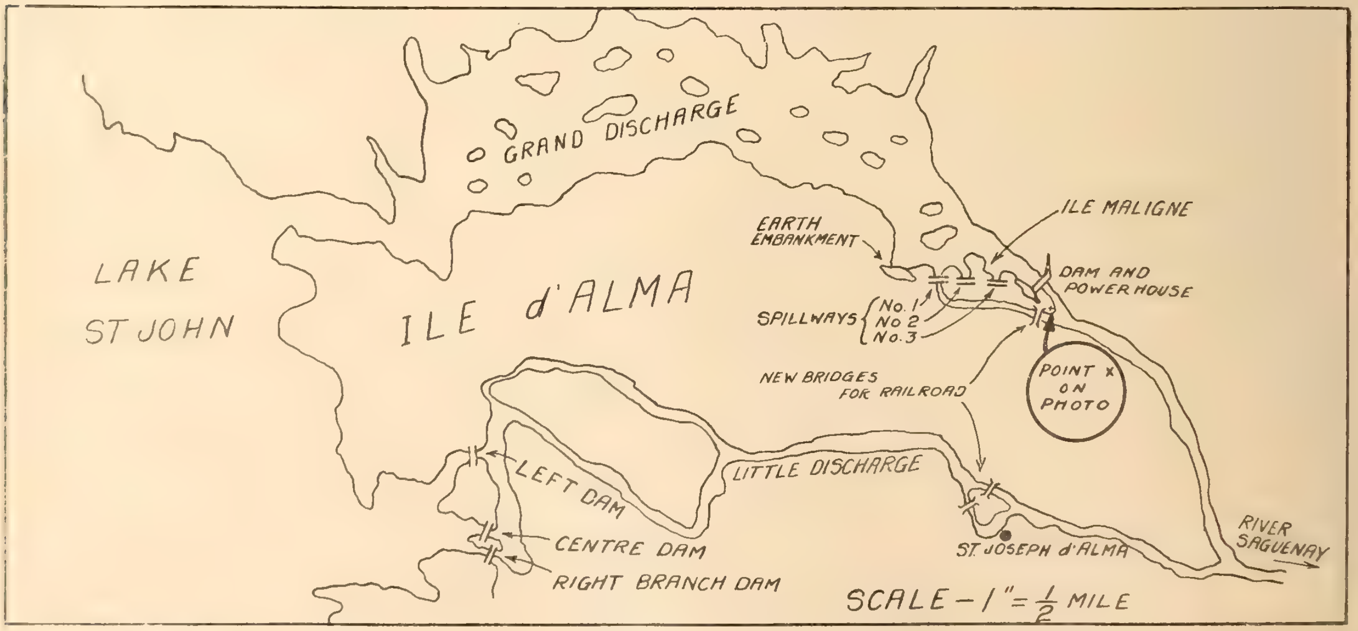
The Dominion Bridge Co. of Lachine P. Q., are supplying about 900 tons of steel work for a high trestle bridge which spans a deep ravine. This bridge will probably be the last to be erected as it is farthest from the existing railway line.

This short stretch of railway will probably cost in the neighborhood of $500,000 or at the unit cost of $40,000 per mile. This is rather higher than usual on account of the nature and contour of the country, being rocky and hilly.

Activities at the Site

The accompanying cut shows a panoramic view of the downstream face of the cofferdam on the Grand Discharge branch. This is to serve to stop the flow of water during the construction of the main concrete dam. It is probably not distinguishable in the cut that the whole cofferdam has been made of timbers that were cut in the immediate neighborhood and used in the dam with a minimum amount of labor spent in trimming and dressing. The cofferdam is practically completely filled with broken stone and boulders and is shown as it will be when performing its duty. Its dimensions are about as follows: length from shore to shore 1,100 ft; height from river bed to top 40 ft.; width on the bottom 40 ft.; width across the top 20 ft.; amount of stone 35,000 cu. yds.; approximate cost in place $250,000.

This project of the Quebec Development Co. is the largest in the province at the present time and is absorbing a big sum of money. It is supplying work to a large number of men in all trades and will no doubt be the means of transforming St. Joseph d'Alma from a small back-woods town to the centre of a thriving community.



General map of the Saguenay and Lake St. John districts showing the location of the power developments on which work is underway

3900 ft. Tunnel to Divert Flow of Lake and Permit the Generation of 115,000 h.p.

$10,000,000 Power Development in B.C.

Alouette Lake Water to be Utilized Along with That of Stave Lake—Present Plant Will be Enlarged and Two New Ones Erected—Extension to Dam is Under Way

Plans are announced by the British Columbia Electric Railway company for a power development of 115,000 horse power on the Stave river. This will be developed in three plants, the construction of which will be extended over a period of five to ten years. It is anticipated that the expenditure will be in the neighborhood of $10,000,000. The present Stave Falls plant was built by the Western Power Company and taken over by the British Columbia Electric Railway Company after absorbing the former company in 1920. This plant has an installed capacity of 52,000 h.p., the fourth unit having been installed by the British Columbia Electric Railway Company in 1922, thus bringing the plant up to capacity.

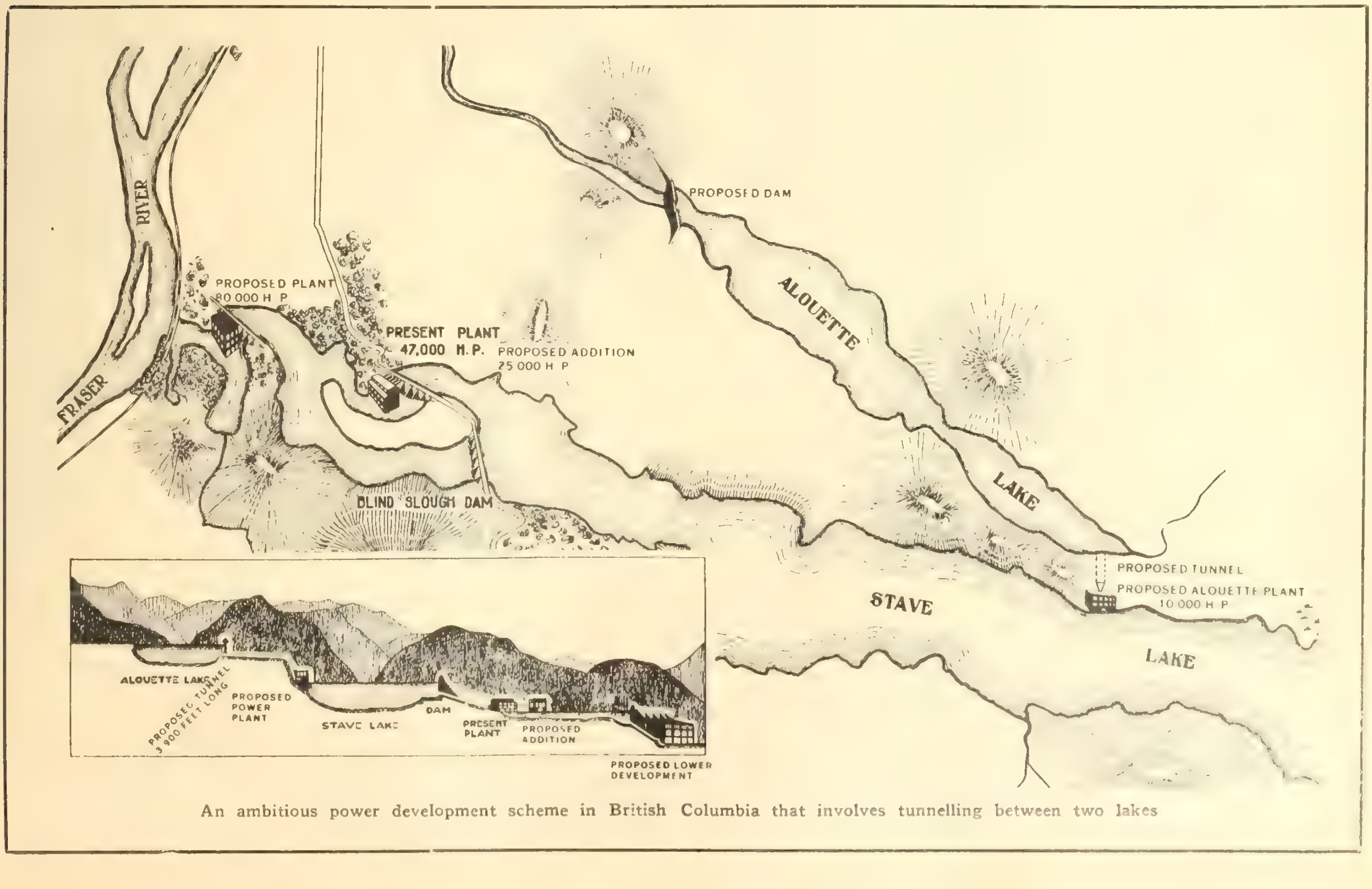
During the last year work has been going on at a cost of $1,000,000, raising the present dam and building a new dam at the Blind Slough, which will increase the water storage fifty per cent.

Adjacent to Stave Lake lies Alouette Lake, distant about half a mile at its upper end. The water rights on Alouette Lake have been held by the Burrard Power Company, a subsidiary company to the British Columbia Electric Railway Company. It was originally intended to develop power by means of a dam and flume, but with the acquisition of the Stave River watershed, it is now proposed to tunnel between the two lakes, build a dam at the lower end of Alouette Lake and divert the water by means of Stave lake and river.

This diversion is at present the subject of an application before the provincial authorities and if permission is given, a power house will be built at the mouth of the tunnel on Stave Lake. This plant will use a head of approximately 140 feet and will generate 10,000 h.p. Although plans are not definitely made, this plant will probably operate at a load factor of over 80 per cent.

The second installation under the proposed scheme is the addition of a fifth unit to the present Stave Falls plant, which will be made possible by the diversion of Alouette Lake water. By operating at a lower load factor than the Alouette Lake plant, 25,000 h.p. will be installed.

Three miles below the present Stave Falls plant, a third plant will be built known as the lower development. At this site it is estimated that a plant of 80,000 h.p. can be erected. The total flow from Stave Lake to tide water will be made use of in the present



An ambitious power development scheme in British Columbia that involves tunnelling between two lakes power house and in the lower development. The upper plant, now in operation, utilizes a 150 foot head and the lower plant will utilize the balance. Construction work on the Blind Slough dam is going on under the direction of R. S. Kelsch of Montreal, consulting engineer. E. E. Carpenter, formerly of the firm of Baker & Carpenter, San Francisco, has recently been appointed chief electrical engineer for the company and he will have immediate superintendance of the proposed new work.

Important Factors in the Care of Water Meters[*]

Wear of Moving Parts, Corrosion, High Temperatures or Sediment Affect the Dependability of the Registration—Periodical Tests Are Necessary

In all types of displacement and current meters the motions of the piston are transmitted by a system of gearing to the register where the flow is recorded in convenient units of measure, such as cubic feet or gallons. The gearing serves to translate the motions of the piston into the units of measure indicated by the register.

The register is at all times a measure of number of revolutions of the piston. It records a true measure of flow only when the meter has been properly calibrated by gear adjustment, and, after proper calibration, will continue to register correctly only so long as the piston continues to make the proper number of revolutions for each unit of quantity passed through the meter. If, after calibration, any condition should develop whereby the piston is compelled to make less than the proper number of revolutions per unit of quantity passed through it, the meter will under-register. If the piston is compelled to make more than the proper number of revolutions, the meter will over-register. The proper number of revolutions is the number made at the time the meter is calibrated. The actual number is not important and is ordinarily not determined. There are, under ordinary working conditions, a number of factors that may cause under or over-registration after comparatively short periods of time. The more important of these factors, which should be guarded against to secure proper registration, are described as follows in a report presented last month to the A.W.W.A.:

Excessive Wear

Excessive wear of the moving parts of the meter may be caused by over-speeding, or, in general, by the selection of meters too small for the work required. The effect of excessive wear of the piston or piston chamber is to cause slippage and under-registration. Excessive wear of the intermediate gear train may cause binding of the gears, breakage of gear teeth or gear slippage. In any case, if the meter is not stopped entirely, under-registration will result. To avoid excessive wear, meters should not be run at destructive speeds.

The rates of flow corresponding to 25-lb. pressure loss, given in the standard specifications for cold-water meters, represent the maximum rates at which water should be passed through meters for short periods of time. They represent peak loads which should come upon meters only at long intervals. These rates would be destructive under continuous service. For continuous 24-hour service meter of the disc or displacement type should not be operated under flows greater than one-fifth the capacity of the meter. Meters of the current type can be operated at higher rates than displacement meters, but for continuous 24-hour service the rate should not exceed one-third the capacity of the meter. If a compound meter is to be used for continuous service at a more or less uniform rate of flow, care should be taken to select a size of meter in which the "change over" point is below the flow which is usually to be measured. Compound meters will not give reliable measurement within the "change over" range; that is to say, within the range covering the change over from by-pass meter to main-line meter.

Temperature

High temperature causes the vulcanized rubber pistons of cold-water meters to expand, tending to create unusual friction or to bind the piston in its chamber. The effect is to cause slippage and under-registration or failure of the meters. Low temperature has no noticeable effect on the working parts of a meter. Freezing will, of course, stop the meter and possibly damage it.

Cold-water meters are not affected by temperatures up to about 80 deg. Fahrenheit. In warm climates where the temperature of the water is liable to go above 80 deg. Fahrenheit, meters with clearances slightly larger than ordinary should be used. Manufacturers are prepared to furnish such meters upon request.

To avoid trouble due to temperature, meters should be set in locations where they will be protected from heat and frost. In locations where hot water from the heating system may be forced back through the meter or where it may be drawn when the mains are emptied, a check and relief valve should be installed on the outlet side of the meter.

Corrosion

The metals used in water-meter construction are all affected, more or less, by the corrosive action of the water passed through them. The action is very slow under most portable waters. Its effect is to weaken parts of the meter, particularly the teeth of the intermediate gears. It may also bind meters lying idle for long periods of time. Tuberculation of the outer case in meters of the current type may change the normal direction of flow through the meter and cause over-registration. Vulcanized rubber is but slightly affected by the corrosive action of water, and where the supply is highly corrosive, vulcanized rubber intermediate gears are recommended. To avoid possible troubles due to corrosion, particularly when meters are purchased in quantity, the meter manufacturer should be furnished with chemical and physical analysis of the water supply. Given this information, the manufacturer can use a composition of metal which in his judgment is most suitable for the particular water in question.

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[*] Extract of a report submitted last month to the American Water Works Association by the Joint Committee on Standard Specifications for Water Meters.

Foreign matter carried by water in suspension has different effects on different types of meters. In meters of the disc and other displacement types fine particles of suspended matter settling in the meter have a tendency to fill the voids between the piston and piston chamber and cause over-registration. Such over-registration is, however, limited and cannot generally exceed 2 per cent.

In meters of the current type the speed of the piston wheel is proportional to the velocity of flow. Any conditions tending to change the velocity of flow, after the meter has been calibrated, will cause inaccurate registration. Accumulations of deposit always tend to cause over-registration and such over-registration is not limited, as in displacement meters.

All meters, except fire-service meters, are provided with strainers to hold back the larger particles of matter which may be carried in suspension by the water, but the meter strainer will soon become clogged if the water is not kept reasonably free of suspended matter. Sand is especially destructive to all types of meters, and care should be exercised to prevent sand from reaching the supply mains.

The finer particles of suspended matter cannot be prevented from reaching the meter and troubles from this source can be avoided only by cleaning the meter periodically, the interval between cleanings depending upon the quality of the water.

Periodical Tests Necessary to Insure Proper Registration

Water meters, properly selected as to size and type, will give satisfactory service over a long period of years without attention only when operated under ideal conditions. Under ordinary conditions meters must be given a certain amount of care to secure proper registration. In most cases it is impossible to ascertain without actual test whether or not a meter which has been in service is registering within the required degree of accuracy. Consequently, in order to insure reliable meter measurement it is essential that all meters be subjected to periodical tests. The interval between tests and the method of conducting them must be governed largely by local conditions. Under average conditions the following intervals between tests should not be exceeded:

Size of Meter	Interval Between Test Years
⅝ in., ¾ in., and 1 in.	5
1½ in., and 2 in.	4
3 in.	3
4 in.	2
6 in. and larger	1

Best results will be obtained from current meters if they are calibrated in place, since the accuracy of these meters is affected by changes in distribution of velocities through the meter. A meter of this type calibrated in a testing machine under conditions where there is a bend near the inlet side of the meter may register incorrectly from the start, if installed under conditions where there is a straight run of pipe in the inlet side. Any other condition tending to change the distribution of velocities as existent at the time of calibration will have the same effect. If calibrated on premises this source of error will be avoided.

For 3-in. and larger meters the installation of a test tee in the outlet piping makes testing easier and reduces its cost.

Information and Inquiries

You are cordially invited to make use of this department

Concrete Proportions; Size of Auditorium

Tweed, Ont.

Editor, Contract Record:

I am asking you to give me a little help in figuring on a concrete foundation. I would like to know how much cement is required for a cubic yard of concrete of a 6 x 1 mix, and also what size a building should be to seat 400 people and leave a stage about 20 ft. deep.

Yours truly,
P. R.

The amount of cement required to make a cubic yard of concrete depends, of course, on the size of aggregate used. The following may be taken as the quanities of materials for one cubic yard of concrete of a 1:2:4 mix, which is equivalent to the 1:6 mix that you ask about:

	Barrels of Cement	Cu Yds. of Sand	Cu. Yds. of Stone
For concrete with 2½″ stone	1.53	0.47	0.93
For concrete with gravel, ¾″ and under	1.34	0.41	0.81
For concrete with stone 1″ and under	1.46	0.44	0.89
For concrete with stone 2½″ and under	1.48	0.45	0.90

In reply to the second part of your query, you may consider for approximate purposes that 7 sq. ft. of floor area is necessary for each person accommodated. This will provide for reasonable aisle space. Provision for the stage will involve extra area. In this case it would mean that a building of somewhere around 2,800 sq. ft. of floor area, exclusive of the stage, would be necessary to accommodate 400 people. To determine the exact requirements it is best to make a layout of the building, blocking in the seats at the required spacing. You will probably require seating of 21 or 22 inches in width and about 32 inches from back to back. By drawing a sketch, using these seating spaces, you will find that 2,500 to 3,000 square feet of floor area will provide accommodation for 400 people.

Insurance on a Land Dredge

Glenannan, Ont.

Editor, Contract Record:

Can you refer me to an insurance company that will insure a land dredge against fire, weather, and sinking in bog?

Yours truly,
W. D.

As far as we can determine, the only company that will undertake to insure your land dredge is Lloyd's. If you will submit answers to the following questions premium rates will be supplied: Weight of machine; make; cost; when bought; nature of work on which it is engaged; where work is; amount of coverage for fire; how long insurance is to last.

Three Schemes of Disposal Suggested as Solution of Hamilton's Sewage Problems

Engineers Recommend the Remodelling of the West End Plant and the Replacement of the Three East End Works by a Plain Sedimentation Scheme

About a year ago the city council of Hamilton, Ont., asked Gore, Nasmith & Storrie, consulting engineers, of Toronto, to prepare a report on the sewage disposal requirements of that city. In accordance with these instructions, the staff of the firm made a thorough investigation of the existing disposal facilities of Hamilton, studied the present and future needs of the city and prepared a report making certain recommendations that aimed to provide Hamilton with adequate facilities for the treatment of sewage for a great many years to come. This report was recently presented to the city council.

The report first presents an analysis of the existing sewage disposal conditions of the city of Hamilton. It points out that there are at present four sewage disposal works treating about 70 per cent of the sewage, the remainder going direct into the bay. The present West End works was built in 1914 at a cost of $62,000 and takes care of the whole western area of the city and the engineers, after an investigation of the efficiency of this plant, recommend its remodelling at a cost of approximately $60,000. The works at present consist of screens, 3 grit chambers and 4 settling tanks. The maximum dry weather flow is about 2.5 million gallons per day. In connection with this, the engineers report as follows:

"The existing works and the main sewer leading to them contain defects which seriously interfere with the efficient operation of the plant. If these defects were remedied the system would work more efficiently and in our judgment take care of at least 25 per cent. more sewage. The settling tanks will have to be remodelled, the overflow and grit chambers entirely rebuilt and the sludge pumping station remodelled. The sludge drying beds should be abandoned and a new method devised for disposing of the sludge. In the past the sludge has been removed from the tanks with considerable difficulty and in order to remedy this the system of piping and pumps used for this purpose will have to be overhauled and improved. Instead of drying the sludge on the beds now used we recommend that enclosed areas be formed with earth embankments in the lagoons north of the works and that the sludge be pumped from the tanks into these lagoons. In this way solid ground will ultimately be formed without the existing expense of handling the sludge.

"The main sewer, 6 ft. 6 in. in diameter, supplying the works, together with the storm overflow, will have to be completely changed from the overflow chamber northwards so as to permit of better operation of the plant. During a storm the tanks and the grit chambers are seriously overloaded. From the overflow chamber northwards this storm overflow sewer will require to be reconstructed so as to effectively protect the works from flooding.

"The plant has been so designed and is at such an elevation that when a better type of effluent becomes essential the tanks may readily be converted to the activated sludge system or trickling filters could be added without the necessity of repumping the sewage. There is no necessity, in our judgment, for putting in any oxidation devices at the present time but we now draw your attention to the possibility of such a situation developing when that whole district is more closely built up."

In the Eastern area of the city, there are 3 disposal plants, known as Ferguson Avenue, Wentworth St. and Gage Ave. plants. These were built in 1896, 1897 and 1910 respectively. These, the engineers think, should be abandoned in favor of new disposal works, designed to take care of the whole Eastern area. In their report, the engineers make a study of the sanitary requirements of the city and the relation of the water supply to sewage disposal. While approving of the location of the city's intake pipes, they point out that as there is always a possibility of an outbreak of typhoid, a chlorine apparatus for treating the water supply should be installed at the earliest possible moment.

In connection with the proposed disposal plants, the engineers have made a population study and base their recommendations on the supposition that the population will increase from the present 120,000 to 265,000 by 1947, 230,000 being alloted to the east end and taken care of by the proposed new plant.

The types of sewage disposal plants considered and the locations and recommendations formulated are given as follows in the report:

Treatment Systems Considered

We have considered the several means of sewage treatment now generally in use, including activated sludge, Imhoff tanks, chemical precipitation, trickling filters, fine screening, plain sedimentation, the direct oxidation process and certain combinations of parts of them. Any of the following three systems of treatment works would be suitable for Hamilton and these we describe in detail with plans and estimates of cost of construction and cost of operation. These three systems we shall describe as follows:

Scheme "A"—Consists of coarse screens, grit tanks, fine screens, Imhoff tanks and pumping of the sludge to the lagoons immediately to the east of the works. We refer to this scheme as the **Imhoff System.**

Scheme "B"—Consists of coarse screens, grit tanks, fine screens, aeration tanks, Dorr clarifiers, and pumping of the sludge to the lagoons immediately to the east of the works. We refer to this scheme as the **Activated Sludge System.**

Scheme "C"—Consists of coarse screens, grit tanks, fine screens, Dorr clarifiers, and specially prepared lagoons into which the sludge will be pumped, with surface protection. We refer to this scheme as the **Plain Sedimentation System.**

Capacity

Any of these schemes for sewage disposal works to be constructed in the neighborhood of the present

Gage Avenue works will treat all of the sewage from that portion of the city of Hamilton east of the Dundurn ridge, due allowance being made for increase in area and population. The works when fully developed will treat during storms at the rate of 80-million Imperial gallons per day of 24 hours. This quantity allows for a storm flow of 2¼ times the average daily dry weather flow (based upon the volume of water pumped and also provides for an excess capacity of 20 per cent for a population of 230,000 people which is a little more than double the population within the existing limits of the eastern area. This 20 per cent excess in capacity is to take care of portions of the works under repair or otherwise not available for treatment. Since all three schemes call for the disposal of sludge by pumping it into the lagoons in the neighborhood of the Gage Avenue works it is advisable to retain all the land already owned by the City for that purpose. It will probably also be necessary in the operation of these works to reclaim land from the bay in the neighborhood into which the sludge can be pumped.

Schemes "A", "B" and "C" are readily comparable in cost and construction; in many particulars the same details are adopted although in actual construction it might be advisable to depart slightly therefrom. The chief features of design in the three schemes submitted are as follows:

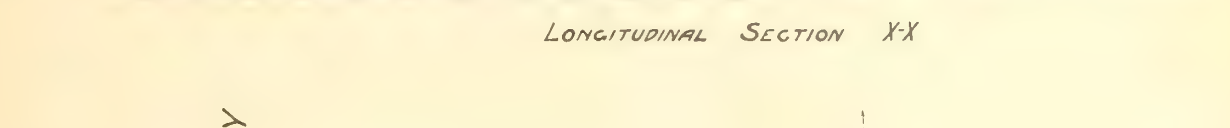
	Scheme "A" Imhoff Tanks	Scheme "B" Activated Sludge	Scheme "C" Plain Sedimentation
Population	230,000	230,000	230,000
Gallons per head per day of sewage	125	125	125
Gallons of sewage per day,			
Dry weather flow	28,750,000	28,750,000	28,750,000
Storm flow	64,000,000	64,000,000	64,000,000
Add for stand-by units. ..	16,000,000	16,000,000	16,000,000
Total maximum for which works are designed, gals.	80,000,000	80,000,000	80,000,000
Average dry weather flow gallons	36,000,000	36,000,000	36,000,000
Aeration period, average		4 hours	
During storms		2 hours	
Settling period, average	3 hours	2 hours	3 hours
During storms	1½ hours	1 hour	1½ hours
No. of treatments units ..	12	12	18
Max. rate of treatment in each unit, gallons per day	6 2/3 mill.	6 2/3 mill	4 4/9 mill.
Size of aeration tanks ..		105 ft. x 70 ft. x 17 ft.	
Size of settling tanks	105'x70' x30' deep	70'-80' dia. x17' deep	70'-80' dia. x17' deep

Coarse Screens, Grit Tanks and Fine Screens

The coarse screens, grit tanks and fine screens are common to all three schemes, "A", "B" and "C", and the details of each of these will be dealt with before taking up the items which refer to each particular scheme. The coarse screens, grit tanks and fine screens will all be placed in one building as shown on the plans. The coarse screens will consist of flat bars placed three inches apart to be cleaned by hand. These coarse screens are inserted for the purpose of removing materials which would otherwise damage the fine screens.

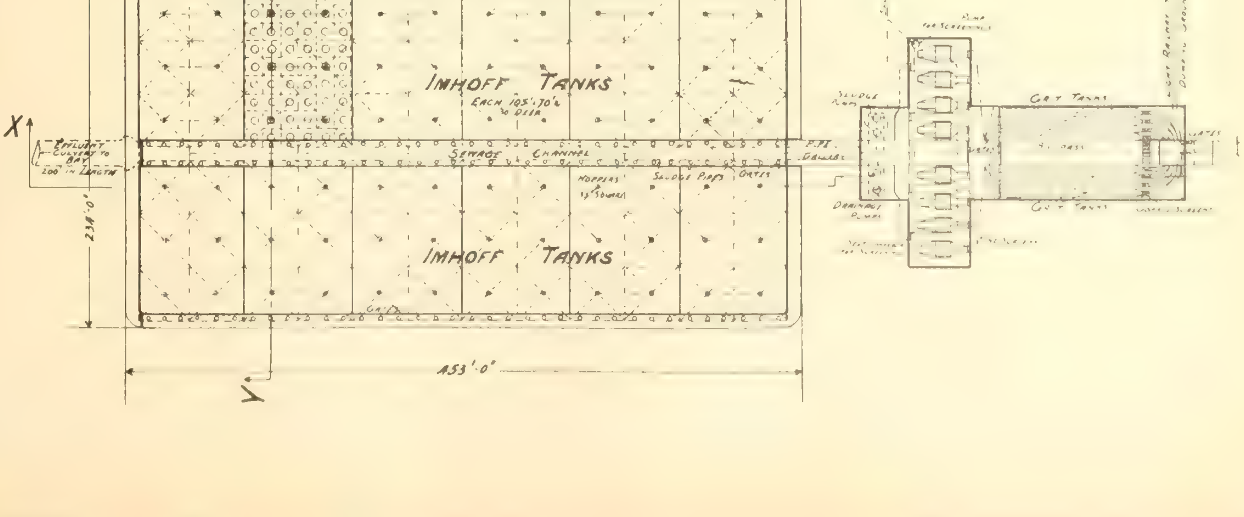
After passing the coarse screens the sewage flows at a velocity of about one foot per second through tanks in which the heavier materials like sand and stone settle out. This velocity is maintained for all rates of treatment. When the grit tanks become filled it is necessary to remove the accumulated grit. By closing the gates at both ends of each of the grit tanks the liquids remaining may be drawn into the drainage system provided in the bottom of each of the tanks. The collected materials are then removed by a grab bucket electrically operated. The material taken out by this grab bucket is deposited in dump wagons and removed to the spoil bank. The dump wagons travel upon light railway tracks and the spoil bank may be conveniently placed so as to form banks for the sludge lagoons. The object of these grit tanks is to remove from the sewage as early as possible those materials which would otherwise hamper the effective operation of the fine screens and subsequent tank treatment.

From the grit tanks the sewage passes through fine screens of the Dorr automatic cleaning type or



LONGITUDINAL SECTION X-X

CROSS SECTION Y-Y



something similar. These screens consist of revolving drums electrically operated with a peripheral speed of seven feet per second, covered with 1/16 inch slots. The sewage passes from the outside through the screens to the inside of the revolving drums and from there to the outlet channels. The screenings are thrown off at the back of the drums and carried to an air lift pump and thence to the lagoons. The object of these fine screens is to remove floating suspended matters which might not readily settle out or which would hamper the operation in the subsequent tank treatment. Screens of this type are in use in most of the largest sewage disposal works and are giving every satisfaction.

There will be 8 sets of coarse screens, grit tanks and fine screens. The object is to secure by preliminary mechanical treatment the removal of as much as possible of the solids contained in the sewage before the final step of treating the sewage in any form of tank. The coarse screens, grit tanks and fine screens with travelling grab bucket, elevators, belt conveyor and air lift are all placed in one building which will be of suitable design and pleasing in appearance. Each part of the works will be easily accessible and by a system of gates any portion can be isolated from the remainder without in any way interfering with their operation. Proper by-passes will be provided so that the whole works, if necessary, can be isolated and the sewage discharged direct to the bay without treatment.

The foregoing statements apply to those parts of the works that are common to all three schemes and we shall now deal with the remaining parts of each scheme separately.

Scheme "A"—Imhoff Tank Design

This scheme consists of coarse screens, grit tanks, fine screens, Imhoff tanks and pumping of the sludge to the lagoons to the east of the works.

In all, there are twelve tanks, each tank being 105 feet long and 70 feet wide. Each tank consists of an upper and lower storey. In the upper storey about 50 per cent of the suspended solids contained in the sewage settle out passing into the lower storey through slots. These slots are baffled from below in such a way that gasses emitted from the solids in the lower storey do not pass through the settling sewage. Funnels are provided for that purpose. In the design prepared the gross area of the funnels amounts to 20 per cent of the plan area of the tank or a net area of 17 per cent. The insides of the tanks have been designed to use segmental parts with the object of facilitating the placing or removal at a minimum of cost. Twelve tanks have been designed, 6 on either side of a central passageway, the whole to be constructed of reinforced concrete. The maximum rate of treatment in each tank during storm conditions will be 6 2/3-million imperial gallons per day and an average rate of 3-million imperial gallons per day during dry weather. The shortest period of treatment during storm conditions will be 90 minutes and the maximum velocity through the tanks 1.17

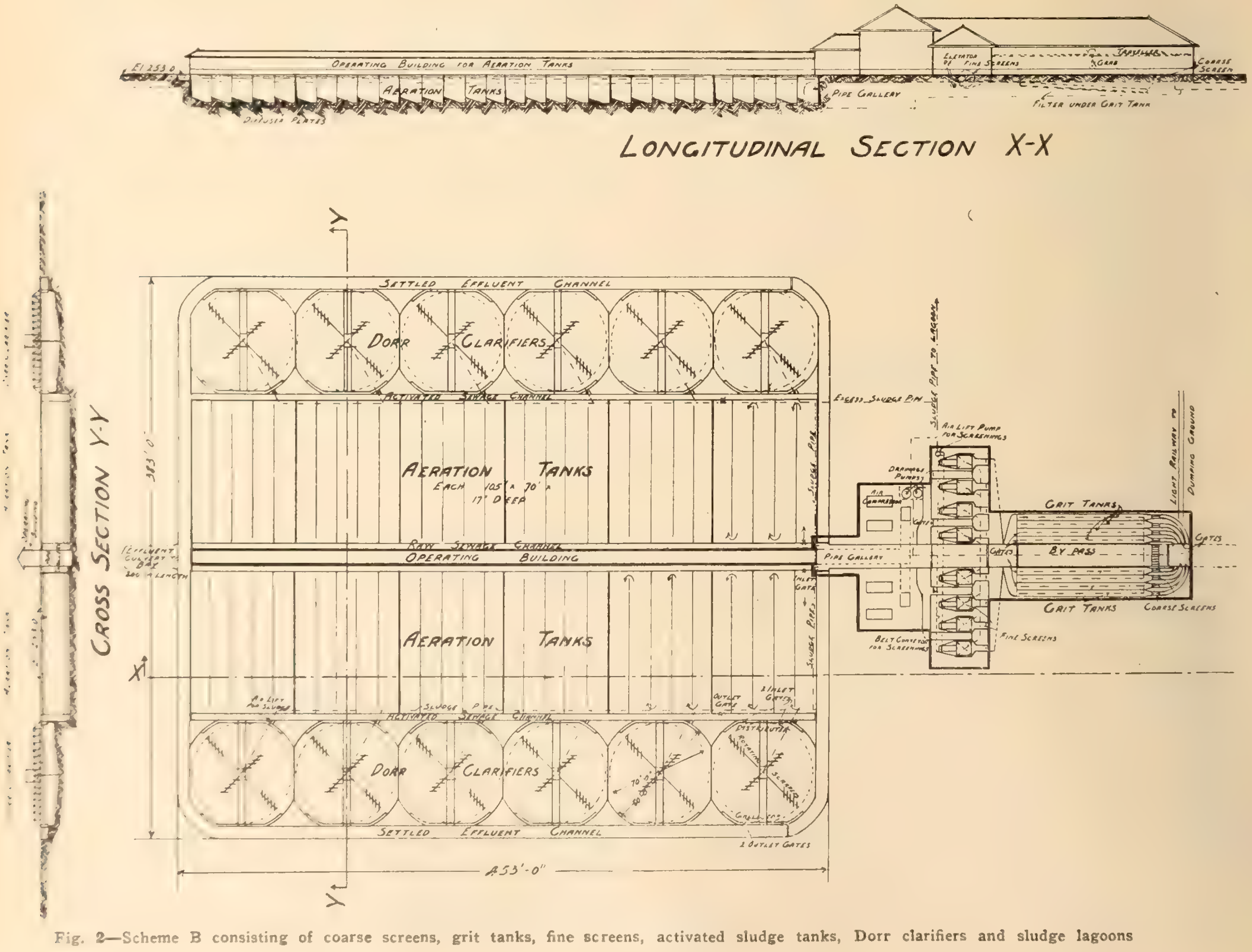


Fig. 2—Scheme B consisting of coarse screens, grit tanks, fine screens, activated sludge tanks, Dorr clarifiers and sludge lagoons

feet per minute. In the lower storey the sludge which collects is held a period of about 6 months during which time almost complete decomposition will have been attained. After the tanks have been properly operated for some time decomposition will continue without any offensive odor.

The bottom of each tank is formed into 6 hoppers, each 35 feet square and a sump is provided in the bottom of each hopper. In the bottom of each sump there is a suction pipe through which the sludge is drawn by a pump which delivers it to the lagoons. In order to facilitate the removal of the sludge, irrigating pipes with jets are laid on the inverts of the hoppers. The storage capacity for sludge in each tank up to the level of 18 inches below the slots amounts to 53,000 cu. ft. or sufficient to provide 2.3 cu. ft. per person for 230,000 people assuming that 10 tanks are in operation, 2 being used as standbys.

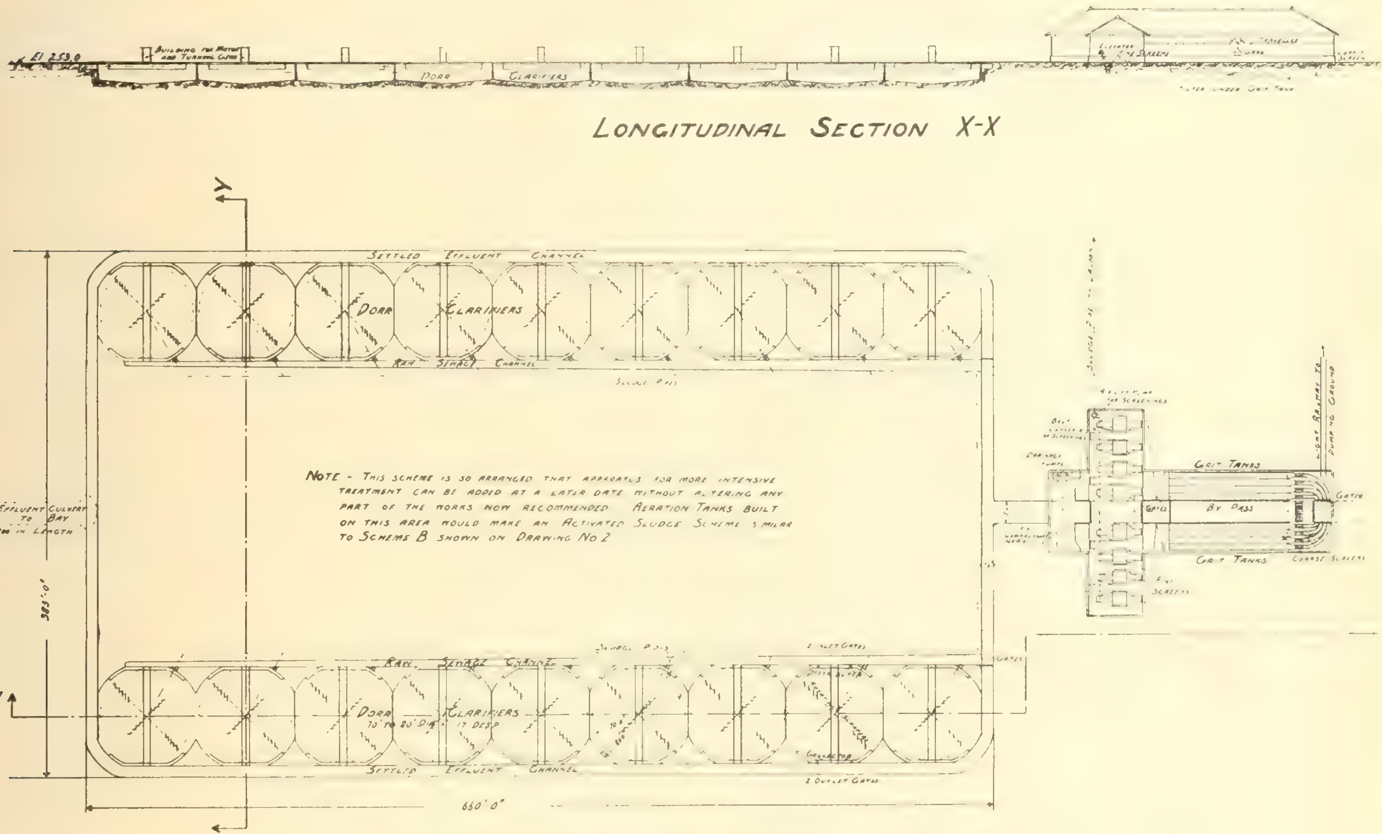

El 253.0
Building for Motor and Turning Gear
Dorr Clarifiers
Longitudinal Section X-X
Settled Effluent Channel
Dorr Clarifiers
Raw Sewage Channel
Sludge Pits
Note - This scheme is so arranged that apparatus for more intensive treatment can be added at a later date without altering any part of the works now recommended. Aeration Tanks built on this area would make an Activated Sludge Scheme similar to Scheme B shown on Drawing No 2
Effluent Culvert to Bay 300 ft in Length
383'-0"
Grit Tanks
By Pass
Gates
Grit Tanks
Coarse Screens
Fine Screens
Raw Sewage Channel
Sludge Pits
Inlet Gates
Dorr Clarifiers 70' to 80' Dia 17' deep
Settled Effluent Channel
Outlet Gates
650'-0"
X
Y

Fig. 3—Scheme C consisting of coarse screens, grit tanks, fine screens, Dorr clarifiers and special sludge lagooning with surface protection

It is well to note that Imhoff tanks when properly operated give off no offensive odors and that the volume of sludge is reduced to a minimum. The sludge rapidly dries out on drying beds to a condition in which it can be spaded and used for manure or for filling purposes. It is not proposed in this scheme to aatempt to dry the sludge, but to pump it direct to the lagoons which will in time fill up and eventually form solid ground. The lagoons will be formed by enclosing areas from the bay in the vicinity of Lottridge Inlet either by sheet piling or roughly formed earth embankments. The effluent from the Imhoff tanks after settlement will pass through a culvert 6 feet in diameter to the bay. The general layout of this scheme is shown in Fig. 1.

Scheme "B"—Activated Sludge Design

This scheme consists of coarse screens, grit tanks, fine screens, aeration tanks, Dorr clarifiers and pumping of the sludge to lagoons immediately to the east of the works.

The activated sludge system is one in which the sewage to be treated is mixed with a considerable proportion of sludge previously derived from the process, and air in a finely divided condition is blown through the mixture after which it is settled and the clear liquids discharged to the bay. This system yields by far the most satisfactory treatment of any existing method of sewage disposal.

The aeration tanks proposed are 12 in number, each 105 ft x 70 ft., and each capable of treating 6 2/3-million imperial gallons per day under storm conditions with an average rate during dry weather of 3-million imperial gallons per day. In addition to the aeration tanks 12 settling tanks are provided for settling the sludge. The aeration tanks are provided with 4 baffle walls that cause the sewage to travel up and down five times during the aeration period. The sewage in the raw sewage supply channel and also in the aerated sewage collecting channels are aerated in a similar way so that these channels form part of the aeration tanks. From the aerated sewage channels the sewage passes into the settling tanks of the Dorr type provided with slowly rotating scrapers which sweep over the whole bottom of each settling tank and slowly draw the settled sludge to the centre of each tank. From this point some of the sludge is pumped by air lift through pipes to be mixed with the incoming raw sewage while the sludge not needed in the treatment is passed into the lagoons. The rotating scrapers are carried by a steel gantry stretching across the tank and the scrapers are rotated by an electric motor fitted with worm gearing. The motor and gearing are carried in a small house at the centre of each tank. Hand operated gates are provided at the inlets and outlets of both the aeration and settling tanks which enables any part of the works to be isolated from the remainder.

The returned sludge may amount to 20 per cent of the total quantity. The average period of treatment will be four hours during average dry weather flow conditions and two hours during storm conditions. The air for aeration purposes will be supplied by air compressors driven by electric motors with 1,700 total gross horsepower supplying 37,500 cu. ft. of air per minute, assuming 1½ cu. ft. of air per gallon of sewage on the average rate of flow. The excess sludge which is passed on to the lagoons will be treated similarly to that from Scheme "A". As the sludge will probably be double in quantity on the dry basis and many times bulkier than Imhoff sludge the lagoons will need to be larger and provision will have to be made for returning a greater quantity of liquid sewage.

The general layout of this scheme is shown in Fig. 2.

Scheme "C"—Plain Sedimentation Design

This scheme will yield an effluent precisely the same as from the Imhoff tanks under Scheme "A". The treatment is a partial one, removing 50 per cent. of the suspended sewage matters and the appearance of the effluent will be entirely satisfactory. The bay for many years to come may be relied upon to oxidize and dispose of the remainder of the impurities. This scheme could be confidently relied upon to solve the existing requirements of the city of Hamilton, but as the population increases and the amount of sewage delivered into the bay becomes greater and greater the time will come when more complete treatment will be necessary. For this reason scheme "C" is laid out so that aeration tanks similar to those in scheme "B" can be added when it becomes necessary to secure a greater degree of purification and this could be done without altering any of the works as at present proposed.

The settling tanks in scheme "C" are exactly the same in design and construction, are similarly placed in relation to the whole works and to themselves as is shown on scheme "B" and are similarly provided with rotating scrapers of the Dorr type. In other words scheme "C" throughout —and the location of each individual part—is exactly similar to scheme "B" excepting that no aeration tanks have been provided. Space is available for adding these at any time and should they be added the scheme will then become exactly similar to scheme "B".

The amount of sludge to be removed will be less than in scheme "B", but greater than in scheme "A". The sludge will have to be pumped to the lagoons and precautions will be taken to prevent odors from developing. This type of sludge if allowed to decompose uncontrolled may become offensive, but recent experiences have shown that by careful management it may be controlled. This system is undoubtedly the cheapest treatment both as to capacity, expenditure involved and operating charges that can be secured by the city and there is no reason why it should not be adopted until the necessity arises for a better effluent. It should be understood that skill will be necessary in the operation of the works, particularly in caring for sludge digestion in the lagoons. The general layout of this scheme is shown in Fig. 3.

Schemes "A", "B" and "C" have been laid out in such a way that considerable proportion of the work could be constructed now leaving additional units to be installed as necessity arises. Generally speaking, two-thirds of the work could be undertaken now leaving the remainder to be carried out as and when required. When the whole of the works referred to under any one of the schemes "A", "B" and "C" have been completed it may be desirable to select a new site for such additional sewage disposal works as may become necessary or if not sufficient space is available at Gage Avenue for still further additions. The works at Gage Avenue have been laid out to take care of the sewage coming from a population of 230,000 people.

Summary of Cost of Works

The estimates covering cost of construction and operation have been made out based on prices prevailing at the beginning of this year. The estimates do not take into account the value of the land on which the sewage disposal works will be constructed nor the sum that will be secured from the selling of the Ferguson Avenue and Wentworth Street sites. A schedule of quantities for the various schemes covering the chief items has been made out and the estimates which follow are a summary of these schedules. We believe the estimates will completely cover the cost at prevailing prices.

	Present cost for a population of 153,000 people	Ultimate cost for a population of 230,000 people
(1) Capital Costs		
Scheme "A"		
Imhoff Tanks	$1,118,000	$1,471,000
Scheme "B"		
Activated Sludge	1,447,000	1,920,000
Scheme "C"		
Plain Sedimentation	814,000	1,012,000
(2) Annual Operating Costs		
Scheme "A"		
Imhoff Tanks	$ 28,200	$ 34,200
Scheme "B"		
Activated Sludge	83,700	117,900
Scheme "C"		
Plain Sedimentation	27,500	33,200
(3) Annual Capital Charges, 30 Years at 5½%		
Scheme "A"		
Imhoff Tanks	$ 77,000	$ 102,000
Scheme "B"		
Activated Sludge	100,000	132,000
Scheme "C"		
Plain Sedimentation	56,000	70,000
(4) Summary of Annual Charges Covering Capital, Sinking Fund and Operating Expenses		
Scheme "A"		
Imhoff Tanks	$ 105,200	$ 136,200
Scheme "B"		
Activated Sludge	183,700	249,900
Scheme "C"		
Plain Sedimentation	83,500	103,200

(5) The following table showe the foregoing estimates worked out on a cost per million gallons and on a population basis:

	for a population of 153,000 people	for a population of 230,000 people
Scheme "A"—Imhoff Tanks		
Capital Cost	$1,118,000	$1,471,000
Capital cost per mil. gals. capacity	46,600	40,900

Capital cost per head of population	7.31	6.40
Annual charges for capital cost	77,000	102,000
Annual charges for operation	28,200	34,200
Total annual charges	105,200	136,200
Cost per mil. gal. treated	12.01	10.36
Annual charges per head of population	.68	.59
Scheme "B"—Activated Sludge:		
Capital cost	$1,447,000	$1,020,000
Capital cost per mil gals. capacity	60,300	53,300
Capital cost per head of population	9.45	8.35
Annual charges for cap. cost	100,000	132,000
Annual charges for operation	83,700	117,900
Total annual charges	183,700	249,900
Cost per mil. gals. treated	20.97	19.03
Annual charges per head population	1.20	1.08
Scheme "C"—Plain Sedimentation:		
Capital cost	$ 814,000	$1,012,000
Capital cost per mil. gals capacity	34,000	28,100
Capital cost per head of population	5.32	4.40
Annual charges for cap. cost	56,000	70,000
Annual charges for operation	27,500	33,200
Total annual charges	83,500	103,200
Cost per mil. gals. treated	9.53	7.86
Annual charges per head population	.55	.45

Conclusions and Recommendations

We have no hesitations in recommending the abandonment of the existing sewage disposal works at Ferguson Avenue, Wentworth Street and Gage Avenue, and the substitution thereof of new works on the Gage Avenue site. The site for the sewage disposal works for the whole eastern area must be settled now. We consider Gage Ave. site to be the best available taking everything into consideration and the elevations now fixed for the new works will fit in with the sewerage system no matter what type of sewage disposal works be adopted.

The more we have studied the sewage problem the more intimately we have found it to be linked up with the water supply. Any recommendations for the treatment of the sewage must inevitably depend upon how the city water is to be treated. Thus if no treatment of the water supply were possible or intended we should be bound to recommend scheme "B" which would deliver a sewage effluent into the Bay with the highest practical degree of purity. If treatment of the water supply by chlorination or filtration or, preferably both, be undertaken, a partial treatment only of the sewage is necessary. It must be remembered, however, that there is always the possibility of the water supply being contaminated from sources other than the sewage disposal works.

In recommending the adoption of scheme "C" for plain sedimentation with the use of Dorr clarifiers and the disposal of the sludge in specially prepared lagoons we do so with every confidence that the system will be adequate for years to come. Under the existing conditions the adoption of a system yielding a highly efficient effluent such as scheme "B" would give is unnecessary. The cost involved both for construction and maintenance under scheme "C" would place no undue burden on the taxpayers. It will be observed that the operating charges for scheme "B" are very high compared with the other schemes.

Scheme "C" is flexible and permits of being converted to scheme "B" should a highly efficient type of effluent become necessary. The size of works recommended to be constructed now will take care of a population of 153,000 people and can be added to from time to time so as to take care of a population of 230,000 people. The initial cost of construction will be $814,000 with annual charges covering capital, maintenance, and operation amounting to $83,500. The annual operating and maintenance charges for 1922 of the Ferguson Avenue, Wentworth Street and Gage Avenue works amounts to approximately $60,000.

We therefore recommend:—

1. That the existing west end works be remodelled and added to at a cost of $60,000;

2. That the existing Ferguson Avenue, Wentworth Street and Gage Avenue works be abandoned;

3. That new sewage disposal works be constructed on the Gage Avenue site to take care of the whole eastern area;

4. That the new sewage disposal works be constructed in accordance with scheme "C" consisting of

(Continued on page 591)

The First Unit of the New Buildings of Trinity College, Toronto

Progress on Gerrard St. Bridge, Toronto

A Three Steel Arch Structure is Supplanting Old Truss and Girder Spans, Thereby Reducing Heavy Grades on Approaches—Details of the Design and Methods of Construction

For many years the bridge over the Don River on Gerrard Street, Toronto, had proved inadequate for the traffic conditions that developed as a result of the growth of the eastern part of the city, consequently it was only a matter of time before a new structure would have been found necessary at that point. As far back as 1913 plans had been prepared but uncertain financial conditions followed by the war prevented any definite start being made toward replacing the old structure. In April of last year, however, the scheme was revived, tenders were called for and the contract awarded for a new bridge, which is the subject of this article.

The structure which is being replaced was built in 1889 and consisted of one 130 ft. truss span over the river with six 25 ft. girder spans supported on steel bents. It carried a 27 ft. roadway and two 6 ft. sidewalks. This bridge was originally built to replace a wooden span which crossed the old channel of the Don River before the course of this stream was straightened in connection with the Don Improvement Scheme. This situation is indicated on the drawing, Fig. 1.

In the years intervening since 1889, the rapid growth of that part of the city served by Gerrard Street and the constantly increasing volume and weight of traffic as time has gone on, has made the bridge obsolete and necessitated its replacement by one more modern in design and more adequate for the traffic requirements of that locality. Consequently, the Department of Works of the City of Toronto, designed the structure which is now in course of erection and which when completed will make Gerrard Street one of Toronto's most important east and west thoroughfares. Not only will it provide a suitable crossing over the Don River, but by being 16 ft. higher than the old bridge will reduce very considerably the heavy grades on the approaches.

Three Steel Arch Spans

The new bridge comprises three steel arch spans of four ribs each. Each arch is three hinged and has a span of 139 feet from centre to centre of end pins. The rise is 15.88 feet. The ribs, which are of the plate girder type, are braced in pairs with struts and cross bracing, the two pairs also being strutted at panel points. Steel castings provide the pin bearings, the castings resting on steel grillages anchored to the piers and abutments.

The deck steel which consists of steel floor beams, and stringers is supported on plate and angle columns which are carried on the ribs, these columns being braced transversly in pairs. The deck itself will be of reinforced concrete, the slab being 10 in. thick under the roadways and 9 in. thick under the street railway track allowance. The width will be 50 ft. between curbs in addition to which two 8 ft sidewalks will be provided. Provision will be made for double railway tracks in the centre, To carry the trolley wires, side poles will be attached to the ends of the sidewalk brackets.

The reinforcement for the track slab will consist of 5/8 in. square twisted rods transversly at 6½ in. centres; for the roadway slab ¾ in. square twisted transverse rods and ½ in. square twisted longitudinal rods at 7½ in. centres will be used. The slabs will be carried on steel stringers to which they are attached at intervals by hook bolts in pairs. The roadway will be paved with asphalt.

A view of the concrete placing equipment

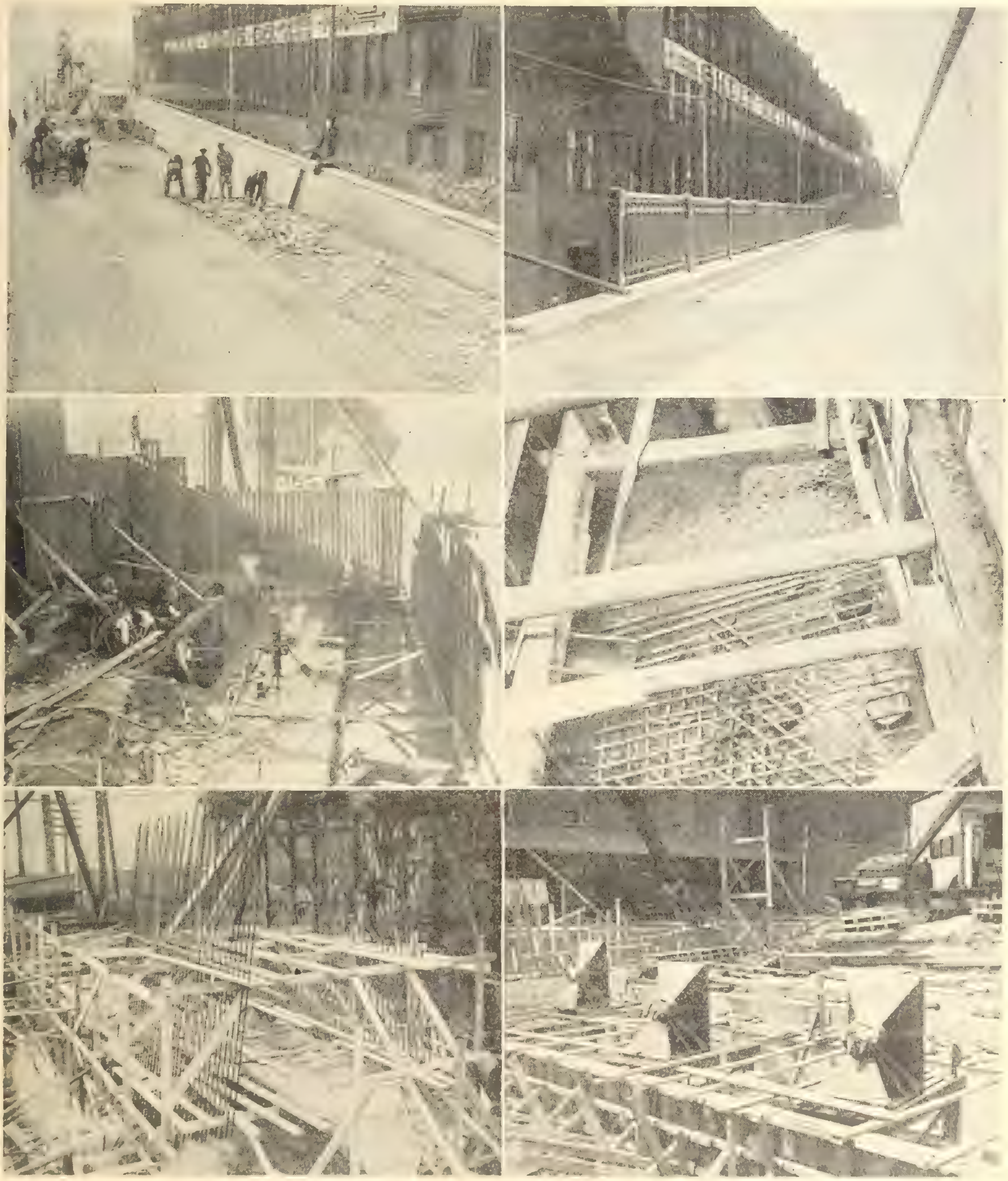
Expansion joints will be provided in the floor at crown and over the piers and abutments. For drainage purposes the roadway is given a vertical curve so as to drain the water towards each end.

Water mains, electric and telephone conduits will be carried under the sidewalks, while two 24 in. gas mains are to be provided for under the track slab.

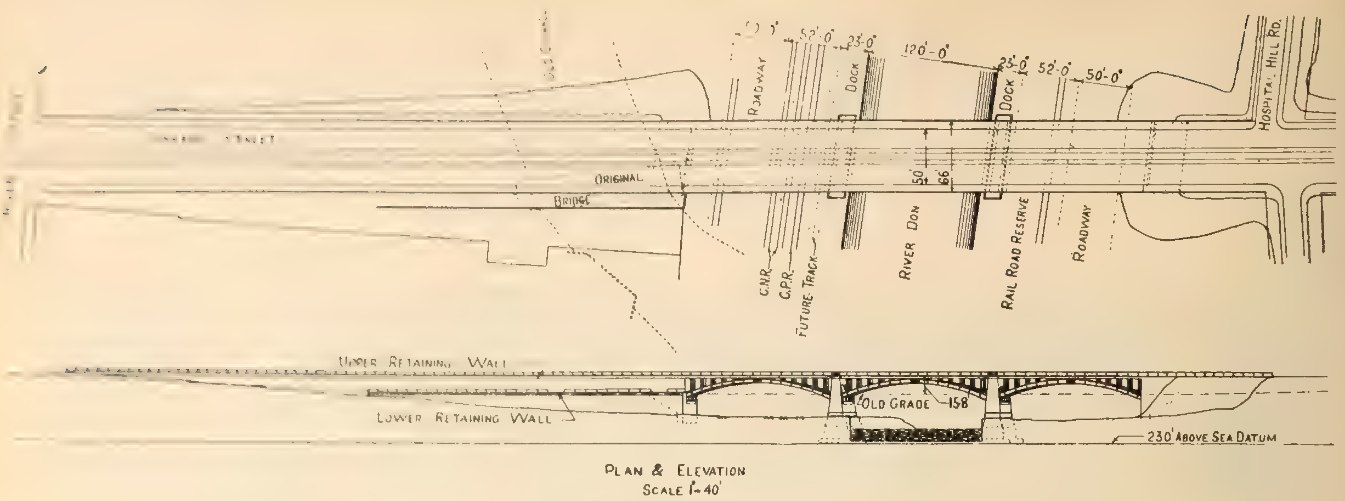
The bridge has been designed to take care of live loads due to 40 ton electric cars, 20 ton motor truck, 20 ton traction engine, and uniform live loads and impact as required by the Ontario Railway and Municipal Board's specifications.

The piers on either side of the river are of mass concrete with spread footings resting on piles. Up to the base of the steel castings from which the ribs

Gerrard St. Bridge, Toronto—Views During Construction



Upper left—The west approach and upper retaining wall. Upper right—The two retaining walls and intermediate roadway. Middle left—Excavation for the west pier. Middle right—Reinforcement in corner of pier footing. Lower left—West pier reinforcement. Lower right—Shoes on the west abutment.



Plan and elevation of new bridge

spring they are solid but above this elevation four arched openings are provided to receive the skew backs. From that point the piers continue upwards to support the roadway and sidewalks. The bases of the piers are reinforced with 1¼in. square twisted rods at 12 in. centres. Reinforcement is also used over the arch openings and in the spread footings. the two abutments, like the piers, are of mass concrete on pile foundations, recesses being provided for the skew backs of the ribs.

The east approach to the bridge will be an earth embankment with side slopes of 1½ to 1.

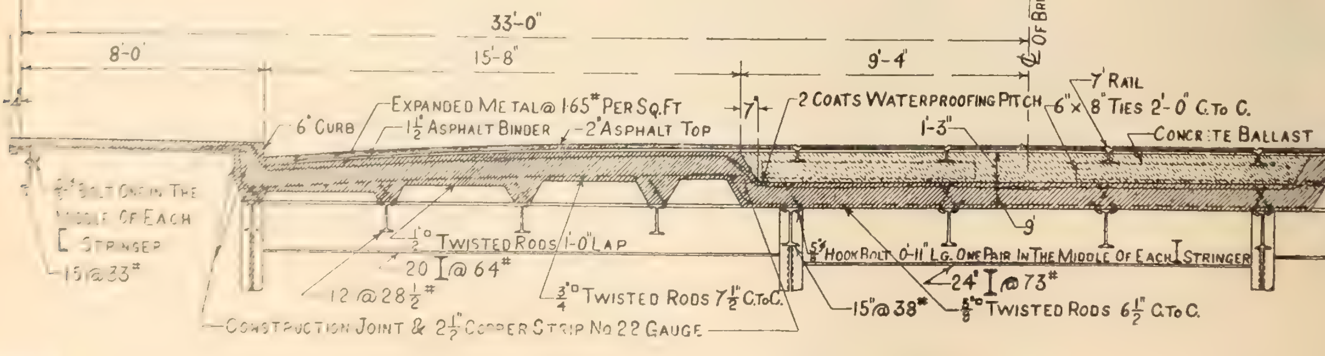
On the west side of the bridge the approach will be an earth embankment, sloping to the north side at an angle of 1½ to 1, but retained on the south side by two retaining walls. These are parallel to one another but have a difference of 15 ft. in elevation, this arrangement being made to provide a road from the top of the hill down to the level of the Don Esplanade and the shipping platform of an adjacent manufacturing establishment which was formerly reached directly from the old bridge. Owing, however, to the new bridge being considerably higher than the old one, the arrangement just described had to be carried out. The road thus provided is about 15 ft. wide.

The upper retaining wall is 525 feet. long, the first 400 feet being of the reinforced counterforted type from 16 to 20 feet high and from 10 ft. 6 in. to 12 ft. 6 in. wide at the base. The remaining portion of this wall is of a gravity type. The low retaining wall which is 250 ft. long, has a gravity section throughout, varying in height from 9 ft. to 20 ft. and in base width from 5 ft. to 13 ft. Expansion joints are provided in both walls at 50 foot intervals.

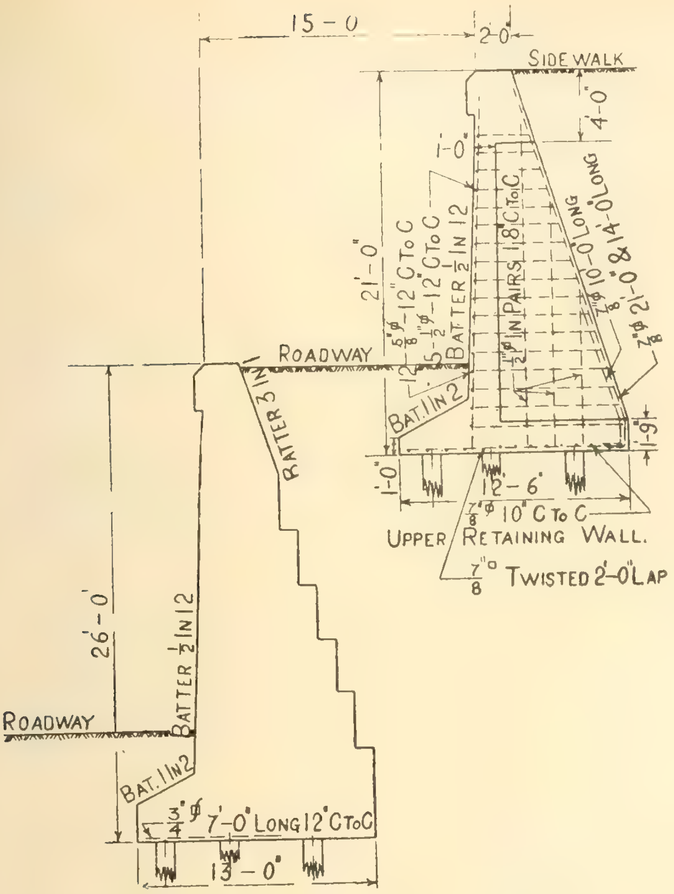
In constructing the new bridge, all traffic along Gerrard St. at that point was diverted and the old bridge dismantled. To facilitate the wrecking operations, a square timber frame was erected under centre of the river span on the old bridge, to carry the weight of the span during dismantling. By means of a traveller operating from the top of the bridge, the river span as well as the first span of each approach section were removed in pieces.

By means of two stiff-legged derricks the masonry of the west river pier was removed, while that of the east river pier was dismantled by a drag line rigged as a crane and operated on a track. The new piers were constructed in cofferdams which were driven as soon as the old masonry was removed to the ground level. On the west pier 7 in. Lackawanna sheet steel piling was employed for the dam, while on the east side 5 x 10 in. B. C. Fir was used. A high degree of tightness was secured by both methods. After the pier foundation had been properly excavated, the piles which measure 30 to 50 ft. long were driven by the steam hammer from swinging leads.

The concrete plant consisted of hoisting towers, relay platforms and chutes through which the concrete was conveyed to the forms. Sand and stone was brought to the site in trucks and lifted to the bins by means of a belt conveyor. As a great deal of concreting was done in the winter time, the aggregate was heated, when necessary, by steam pipes


33'-0"
8'-0"
15'-8"
9'-4"
℄ Of Bridge
7' Rail
Expanded Metal @ 1.65# Per Sq.Ft
6" Curb
1½" Asphalt Binder
2" Asphalt Top
7"
2 Coats Waterproofing Pitch
6"x8" Ties 2'-0" C.To C.
1'-3"
Concrete Ballast
Bolt One in the Middle of Each [Stringer
15 @ 33#
½" Twisted Rods / 1'-0" Lap
20 I @ 64#
12 @ 28½#
¾" Twisted Rods 7½" C.To C.
9"
Hook Bolt 0'-11" Lg. One Pair in the Middle of Each I Stringer
24" I @ 73#
15" @ 38#
⅝" Twisted Rods 6½" C.To C.
Construction Joint & 2½" Copper Strip No 22 Gauge

Half cross-section of floor of bridge



Cross-section through upper and lower retaining walls

located in the bins. For the retaining walls concrete was placed in 50 ft. sections starting from the west end, each section being placed in three parts, namely footings, wall and coping. In the footings, concrete was placed by chuting from the mixer or by buggies. In the case of the walls and copings concrete was raised to the platform from which it was moved to the forms in buggies.

At the present time the situation on the work is about as follows:

The old steel work has been largely removed, while the old masonry has been entirely taken down. The excavation and piling for the foundations is all complete, the two retaining walls are nearly complete and the fill on the approaches is about half done. The steel castings for the arch bearings are being placed. As far as concrete work is concerned, 67% has been completed.

The plans and specifications for this bridge were prepared by the Department of Works, City of Toronto, while the construction is being carried out by the Russell Construction Co. Ltd., Harbor Commission Building, Toronto.

Toronto "Globe" Comments on Article

The article dealing with the advisability of engineers entering public life, which appeared in the recent annual number of the Contract Record has created widespread interest. Even the daily press has observed the timeliness of the topic as the following editorial from "The Globe" of Toronto indicates:

"Should engineers enter public life?" is a question considered in a collection of letters appearing in The Contract Record and Engineering Review. Some interesting points are raised in the answers. It is said that engineers are mainly salaried employees, and would thus be hampered in the expression of their opinions. Private duty might conflict with public duty. Engineering is an exact science, says another; politics is not. It would be ridiculous for an engineer to promise the electors to raise the permissible stress on a certain material from 10,000 to 12,000 pounds.

One who gives an affirmative answer says that the engineer's work brings him in direct contact with nature and her laws, and makes him desire to be guided by facts rather than by theories or prejudice. He is unlikely to make a satisfactory politician in the usual sense, for he would be inclined to follow a straight rather than a diplomatic course. Is that quite certain? An engineer laying out a road sometimes finds it better to go round a hill than climb it, a course for which politicians are frequently blamed.

The question is one which engineers must decide for themselves. Outsiders can only say that Parliament ought to contain the greatest possible wealth of ideas and knowledge, and that engineers could make valuable contributions of both. They might also work some improvement in the standards of public life, but on that point it is well to be cautious in prophesying. The conditions, problems, temptations and difficulties of public life are much the same for all sorts and conditions of men; and disappointment and disillusion are apt to await those whose expectations are too great. There is one idea, however, of which the engineer in public life need never lose sight, and that is construction, which a world ravaged by destructive passions needs above all things.

Solution of Hamilton's Sewage Problems

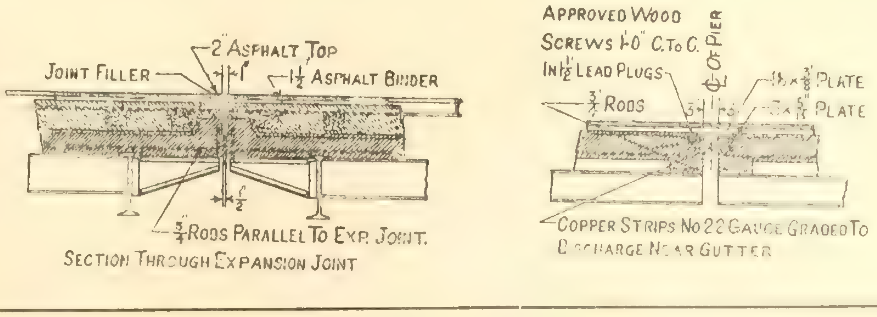
(Continued from page 587)

plain sedimentation with sludge disposal in specially prepared lagoons. This involves a construction cost of $814,000 with annual charges of $83,500 for the initial portion to be built to take care of a population of 153,000.

5. That all sewers conveying sanitary sewage be connected up to one or other of the sewage disposal works.

6. That the existing so-called infiltration basin connected with the city's water supply be abandoned and that a chlorinating apparatus be installed at the water works pumping station to treat the water supply of the city.

Sections through expansion joint over crown pins and piers.

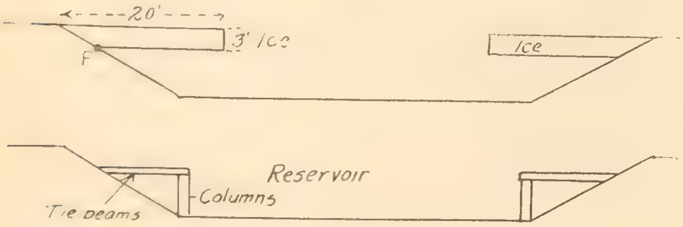

2" ASPHALT TOP
JOINT FILLER
1"
1½" ASPHALT BINDER
½"
3/4" RODS PARALLEL TO EXP. JOINT.
SECTION THROUGH EXPANSION JOINT
APPROVED WOOD SCREWS 1'-0" C. To C. IN 1½" LEAD PLUGS
℄ OF PIER
3/4" RODS
3/8" PLATE
5/8" PLATE
COPPER STRIPS NO 22 GAUGE GRADED TO DISCHARGE NEAR GUTTER

Hints for the Contractor

Columns and Beams Protect Reservoir Lining from Ice Action

S. H. Excell, city superintendent of Vernon, B.C., submits the following item indicating how low temperature affects design. The accompanying photograph was taken during April 1922 to illustrate how ice can cause damage to a concrete lined reservoir. During most of the winter the water level was maintained fairly constant, but during intermittent spells of below zero weather, the water supply ran low and caused variations in level. As a result, the covering of snow and ice which had become over 3 feet thick and extended fully 20 feet out from the lip of the reservoir, caved in while the water was low and tore the concrete lining rather badly. The lower edge of the ice covering formed the fulcrum which brought about the damage.

How action of ice destroyed lining of reservoir

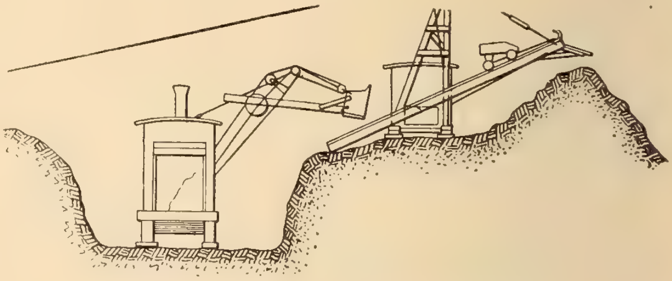


A type of construction for preventing the destruction of reservoir lining

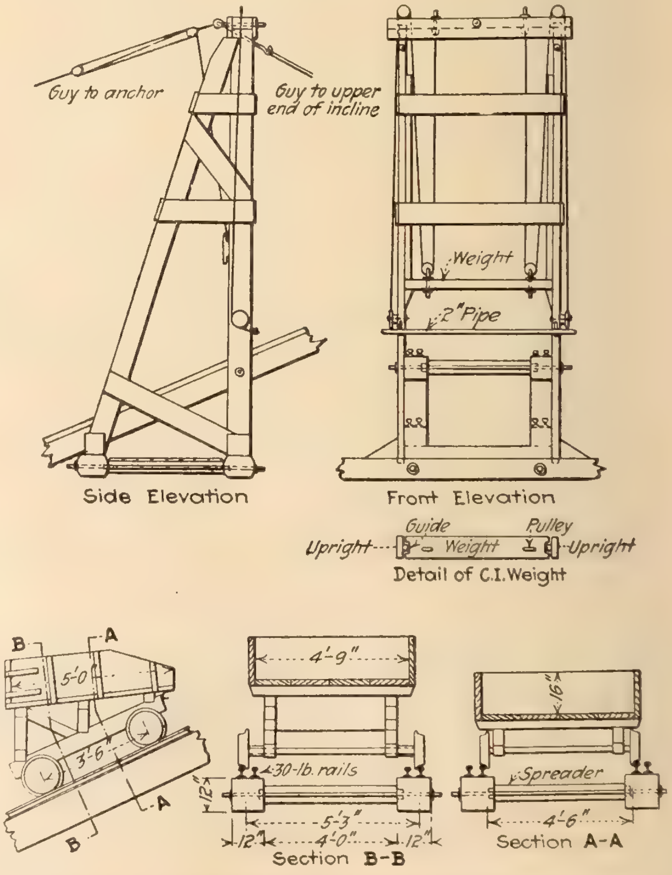
To safeguard against similar occurences, it is proposed to erect re-inforced concrete columns and tie beams, suitably spaced, so that when ice forms it will have ample support until such time as a sufficient supply of water in the spring will maintain a high water level and allow the ice to gradually melt out of the supporting structure.

Skip on Portable Incline Supplements Steam Shovel in Excavation

A portable, inclined track with a power-operated skip used in the excavation of the canal for the Hat Creek No. 1 hydro-electric plant recently built by the Pacific Gas & Electric Co. in northern California, made it possible to use a steam shovel of ordinary size for excavating a canal 10 ft. deep and still maintain a wide berme along the edge of the



Sketch showing relation of shovel and incline



DETAILS OF INCLINE, SKIP AND COUNTERWEIGHT canal. The canal is 17 ft. wide at the bottom, has side slopes of ¾ to 1 and in its length of 2,600 ft. required the removal of about 24,000 cu. yds. of rock and earth. Engineering News-Record describes the job as follows:

This yardage did not warrant taking a special, large-sized shovel onto the job, which is in a remote district, and the plan worked out called for only such equipment as was conveniently available. A 2-in. compressed-air line was already laid along the canal for serving rock drills and this line was tapped at intervals for power to operate the skip. Under the plan devised the shovel dipper delivered to a skip operating on an inclined track built upon a heavy skid frame, which also carried a double-drum air-driven hoist. The incline was braced and guyed with the aid of a tower, as shown in the accompanying illustration, and material dumped from its upper end was delivered 20 to 25 ft. from the edge of the canal.

The incline was made of 12 x 12-in. timbers with 6 x 6-in. braces and 1-in. iron tie-rods. Two pairs of rails were used, the front wheels fitting the inner pair and the rear wheels the outer pair, so that automatic dumping at the upper end of the incline could be accomplished in the usual way. At the top of the incline the outer rails were bent up to form a bumper, while the inner rails were bent down at an angle of 45 deg.

At the outset the empty car did not readily start back down the incline. This was overcome by arranging a weight, as shown in the illustration, so that when the loaded car was pulled up in the last few feet of its travel it raised a counterweight. This counterweight in turn started the skip back down the incline when tension on the hauling line was slacked off.

When it was desired to move ahead the guy across the canal was released and a line was carried to a deadman some distance ahead. Power for moving the entire outfit on its skids was provided by the same hoisting engine which operated the skip.

Mechanical Engineers Meet in Montreal

Several hundred mechanical engineers from all parts of the United States and Canada attended the spring meeting of the American Society of Mechanical Engineers, which opened on May 28 in the Mount Royal Hotel, Montreal. The convention lasted four days. The opening morning of the convention was devoted to a council meeting, followed in the afternoon by a business meeting and an interesting address by the secretary, Calvin W. Rice, who described his trip to South America.

In the afternoon there was a public hearing on two power test codes, part of a group of nineteen which are being framed as aids to industry by 125 leading engineers, scientists and educators under the auspices of the American Society of Mechanical Engineers. One of the codes related to instruments and apparatus used for measuring physical and chemical quantities in connection with tests of power equipment. C. F. Hirschfeld, of Detroit, is chairman of the committee preparing the code on instruments and apparatus. The second code dealt with internal combustion engines, and had been formulated by a committee headed by Dr. Charles E. Lucke, of the School of Mines, Engineering and Chemistry of Columbia University. Fred R. Low, of New York, chairman of the main committee of twenty-five, which code revisions are proceeding simultaneously in Great is directing the code work, disclosed that power test Britain and the United States, and that the result was likely to be uniformity of practice among engineers in the English-speaking world.

On Monday evening the council of the A.S.M.E. were guests of the Engineering Institute of Canada at dinner at St. James club, when president W. J. Francis of the E.I.C. presented a gold badge to president J. L. Harrington of the A.S.M.E.

Water Power Development

At the Tuesday morning session (May 29) a paper by Julian C. Smith, chief engineer, the Shawinigan Water & Power Co., was read on "Power Development in the Province of Quebec." This was followed by a paper on "The Development of Hydro-Electric Power Plants in Ontario," by Frederick A. Gaby, chief engineer, the Ontario Hydro-Electric Power Commission. Other papers read included: "Management Engineering in the Paper Industry," by R. B. Wolf, and "A Practical Laboratory and Drawing-Room Course in Industrial Engineering," by Myron A. Lee.

In the afternoon H. R. Naylor, of the Canadian Pacific Railway, read a paper on "Steel-Car Construction at the Angus Shops of the Canadian Pacific Railway," and C. E. Brooks, a paper on "Some Recent Developments of the Motor Car."

During the afternoon of Tuesday visits were paid to places of interest in the neighborhood. A large party went to Angus shops, while another party inspected the power plant at Cedar Rapids under the the direction of H. B. Pope, superintendent of generating stations, and L. A. Kenyon, superintendent of distribution.

At the sessions on Wednesday morning, papers were read on port development and power. A paper on "The Harbor of Montreal" was read by F. W. Cowie, consulting engineer to the Montreal Harbor Commission, and "Port Development," by R. S. MacElwee. An interesting paper on "Modern Hydraulic Turbines of Large Capacity" was presented by H. G. Acres, hydraulic engineer to the Hydro-Electric Power Commission of Ontario.

No sessions were held in the afternoon, as parties were conducted over Montreal harbor, the elevators and cold storage plant, while others were taken through the plants of Frontenac Breweries, Ltd., John H. R. Molson and Bros., and the National Breweries, Ltd.

At the sessions on Thursday morning (May 31) two papers were presented in the "Machine Shop" section, two in the "Fuels" section and three in the "General" section. One paper on "Lignite Char" by O. P. Hood dealt with the use of this material as a substitute for anthracite. Another interesting item on Thursday morning was the presentation of a report by the Special Research Committee on fluid meters. J. S. Pigott, the chairman, explained the work of his committee during the past five years, and said that the report as it now stands has become practically a text book on the subject of flow meters and will provide not only a means of determining flow meter dimensions and constants for use of the user of flow meters, but also all of the data required by the designer of flow meters.

In the afternoon the delegates were the guests of the Dominion Engineering Works, Limited, at the

Lachine plant, where they were afforded the opportunity of seeing the different paper machines and hydraulic turbines now being constructed at the works.

New Roofing Company is Making Active Strides

A new company has appeared on the industrial horizon which, judging by the energetic manner in which it is now pushing towards full activity, promises to become an important part of the Canadian manufacturing world.

This is the new roofing organization known as Alexander Murray and Company, with head office in Montreal and a fully-equipped manufacturing plant at Ville la Salle, a suburb of Montreal.

The personnel of the company, as announced, indicates that there will be no lack of wise and efficient direction of affairs in the career of the latest addition to our manufacturing sphere. Every officer has had a wide and varied experience in the roofing line. John C. Runkle, the president, has an international reputation in the roofing business and until recently was president of The Barrett Co., Ltd. L. O. P. Walsh, the vice-president, was formerly vice-president and general manager of The Dominion Tar and Chemical Company Ltd., while the secretary-treasurer and manager, Arthur H. Marden, up till a short time ago was manager of The Barrett Co., Limited, Toronto.

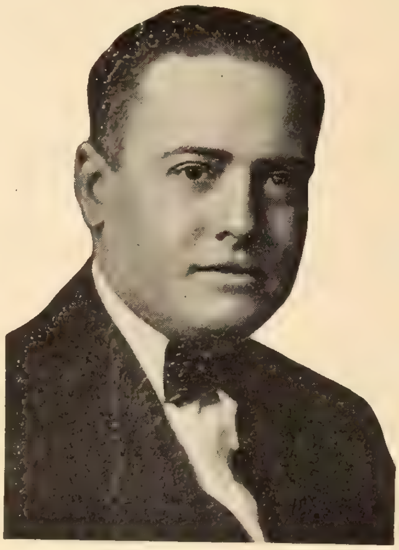
The directors are D. J. Munn, formerly president of Alex. McArthur & Co., Ltd.; Thomas M. Rianhard, formerly president of the Barrett Company; John C. Runkle, E. Bernard Smith, Montreal, manager of The British American Oil Company, Ltd., and L. O. P. Walsh, all well-known in Canadian business circles.

The company is already producing and states that opening operations are encouraging. Products include

(Continued on page 596)

Executives of Alexander Murray and Company of Montreal

John C. Runkle, president



Arthur H. Marden, secretary-treasurer and manager, Montreal

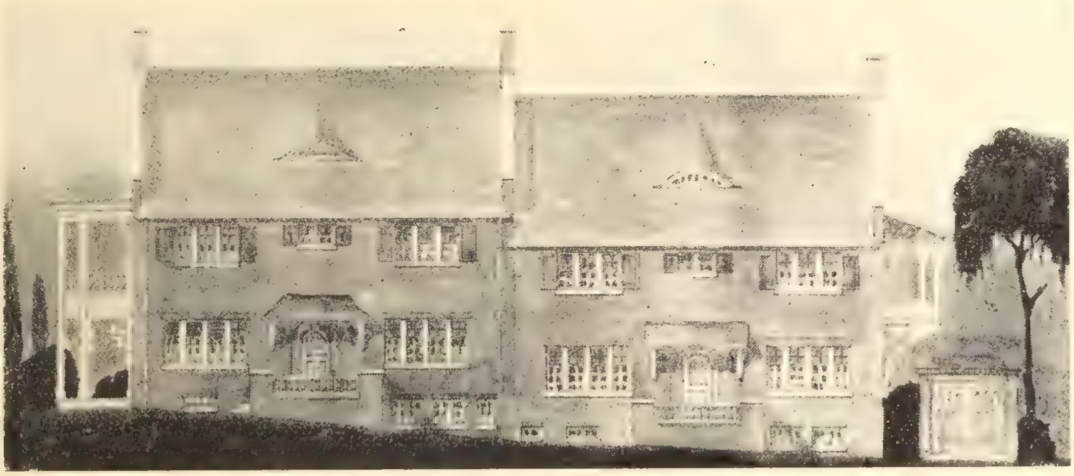
John F. Tobin, manager, Toronto branch

A. O. Saunderson, manager, Halifax branch

Gordon Runkle, manager, Vancouver branch

The Contract Record's

Weekly House Suggestion No. 71

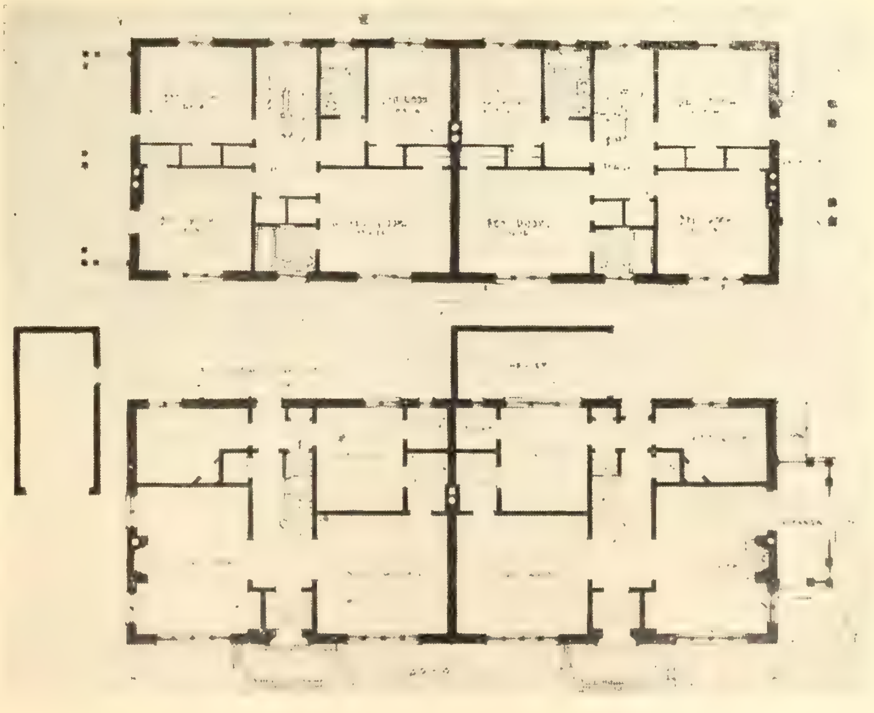


We are showing this week a pair of semi-detached houses erected recently at Montreal, which embody a number of interesting features. The houses are similar in design and layout, are constructed of a brown-tone face brick and roofed with slate. The attractive entrance is the main feature of the exterior appearance. It is also of brown brick, trimmed with stone.

The wide, through hall provides convenient access to all rooms on the ground floor and the rear entrance in both houses opens directly on this hall. A very handy kitchen, pantry and dining room arrangement has been secured in this plan.

The bedrooms are well arranged and amply provided with closet space. As seen on plan, the main bedroom in each house has the convenience of a private bathroom. The floors and trim throughout both houses are of hardwood.

The cost of these two houses was about $30,000 and they were designed by Mr. Arthur Stuart Pavey, architect of London, Ont.



New Roofing Company

(Continued from page 595)

a complete line of roofing and paving materials, with such allied products as dry and tarred felts, sheathings, asphalt roofings and shingles, road materials, paints, stains, wood preservatives, disinfectants, etc.

The company will operate nationally. Branch offices and warehouses have been opened in Toronto, Halifax and Vancouver.

An energetic advertising campaign is to be instituted shortly in newspapers and trade journals. The slogan of the new company is "Made by Murray—Alexander Murray."

Mainly Constructional

East and West—From Coast to Coast

The Northern Canada Power Company, Cobalt, Ont., have let the contracts for the first unit of their proposed power development at Des Quinze. Morrow & Beatty, of Peterboro, will build the power plant, while Sutcliffe & Neelands, engineers of New Liskeard, Ont., have been engaged to survey the transmission line. The first unit will develop 25,000 h.p.

A matter of great interest to navigation authorities received the attention of the executive committee of the Dominion Marine Association, at their meeting recently at the King Edward Hotel, Toronto. The Dominion cabinet was urged to ask for restraining measures in reference to the excess amount of water permitted to escape from the Great Lakes through the Chicago Drainage Canal. This diversion has seriously affected lake levels, causing a decrease of from 35 to 75 tons carrying capacity for each inch of draft lost by the lake carriers. Water should be used for sanitation, navigation and, lastly, power, according to the order set out by the treaty of 1910. At Washington in 1912 diversion was limited to 4,187 cubic feet per second but Chicago greatly exceeds this in practice, declared the association.

Having secured the Provincial Government's promise to contribute $125,000 toward the extension of the Home for Incurables, Dunn Ave., Toronto, the directors asked the Board of Control recently for a similar contribution from the city. The new building, furnished, will cost $300,000, of which the directors offered to furnish $50,000 for the furnishings. The board referred the matter to the Medical Officer of Health and Commissioner of Finance for a report.

Application has been made to the Building Department of Toronto, by A. Brown & Co., for permission to erect a six-storey departmental store at the corner of Yonge and Dundas Streets, at an estimated cost of $100,000. Plans have been prepared and submitted to civic authorities for inspection. The architects are Symons & Sparrow.

Reeves and councillors from the municipalities of North Norfolk, Victoria, Morris, Rhineland and Montcalm, Man., who waited on Hon. W. R. Clubb, minister of public works, recently, were assured that government aid would be lent in reconstructing bridges and sections of roads which were wiped out in the spring floods.

A start was made recently on the construction of the $1,500,000 plant for the National Cement Company, at Montreal East. This large plant will be completed, it is anticipated, in about a year.

At the recent annual shareholders' meeting of the Lyall Construction Company, of Montreal, the present directorate was reappointed. It was announced at the meeting that the firm has at present on hand $15,000,000 of work.

The Northern Construction Company, of Vancouver, states a recent report from that city, has been awarded the contract for the construction of 1,200 miles of railway in China. The contract was signed during the recent visit of the vice-president of the company, Mr. C. V. Cummings, to China. This work will entail an expenditure of between $25,000,000 and $35,000,000, it is estimated.

The British Empire Steel Corporation, of Sydney, N.S., has declared itself unable to meet the demands of its employees for a twenty per cent wage increase and refused on principle to adopt the check-off system which would amount to recognition of the Steel Workers' Union.

The Western Steel Products, of Winnipeg, are establishing a branch plant at Port Arthur, Ont., it is stated, under the managership of Mr. B. F. Cameron, formerly superintendent for the Northern Engineering Company, of Fort William. The company have secured the buildings of the old Lakeside Lumber Co., at Inter-City and will commence operations as soon as equipment has been installed, with a staff of 70, largely composed of skilled mechanics. The products of the company include fireproof windows and doors, range boilers, oil barrels, storage tanks for oil, sanitary tanks, metal lath, etc.

Culverts and other waterways along the highways of New Brunswick which were carried out or damaged in the recent floods are being replaced by others which are fifty per cent larger.

In the last issue of the Ontario Gazette announcement was made of the incorporation of the Riselay Brick Company, Limited, which will have its headquarters in Hamilton. The new concern will carry on the business of general contractors, and its present provisional directors are: C. E. Riselay, Mrs. Lucy A. Riselay, William E. Smith, Freeman F. Treleaven, and Russell W. Treleaven, all of Hamilton. The new concern will commence operations at once, according to an announcement made a few days ago. It is capitalized at $40,000.

Personals

Mr. W. S. Baird has been appointed drainage engineer and township surveyor for Scarboro Township, Ont.

Mr. H. N. Necker resigned recently as chief engineer of the Department of Roads, Quebec, to join a large road contracting company at Sherbrooke, P.Q. Mr. Gabriel Henry, consulting engineer to the Department of Roads, succeeds Mr. Necker as chief engineer.

Obituary

Mr. Thomas J. Sproule, building contractor of Toronto, died recently in his seventieth year. Deceased was born at Holland Landing, Ont., and for the past 30 years had been engaged in the building business in Toronto.

The death occurred recently of Mr. H. W. Petrie, head of the large machinery firm of H. W. Petrie, Limited, of Toronto. Deceased began his career in the machinery business at Brantford, Ont., fifty years ago.

Trade Incorporations

Carillon Contracting Co. Ltd., with head office at Montreal, capital $50,000, to carry on the business of general contractors and engineers.

Lake Superior Contracting and Development Co. Ltd., with head office at Fort William, capital $40,000, to carry on a general contracting business.

CONSTRUCTIONAL ACTIVITY

Period of June 6 to June 12, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Brantford, Ont.

About 1,500 lineal feet of 12″ glazed tile sewer pipe will be purchased by the City for the construction of storm sewers on Clarence, Elgin, Murray, Grey and Chatham Sts. S. F. Leonards, clerk.

Fredericton, N. B.

It is possible that the City may build a reservoir with a capacity of 1,000,000 gallons. A commttee has been appointed to investigate the matter. C. M. McDowell, engineer .

Greensville, Ont.

West Flamboro Township, J. Tew, Greensville, reeve, contemplate concrete walks from Dundas St. to Creighton Rd., a distance of about three quarters of a mile.

Guelph, Ont.

Concrete pavements costing $102,000 will be constructed for the City by day labor. N. S. Nicklin, clerk.

About June 15 the City will commence work on an extension to the waterworks system costing $4,000.

Hamilton, Ont.

The City will receive tenders for the construction of sewers on various streets until June 20. S. H. Kent, clerk; W. L. McFaul, engineer.

The City contemplates paving an alley in the rear of houses facing James St., from Duke St. to Bold St.

Paving McNab St., from King to Main St., is contemplated by the City. S. H. Kent, clerk.

Hamiota, Man.

Tenders for grading roads will be received by J. Andrews, secretary, until June 16. Specifications may be had from the secretary at Room 315, Parliament Buildings, Winnipeg.

Harriston, Ont.

W. D. McLellan, Harriston, Clerk of Minto Township, will receive tenders for the construction of municipal drains, Nos. 11 and 12, until June 18. This work will consist of excavating 23,814 cu. yds. for open ditches and 2,342 lineal feet of tile drains.

Minitonas, Man.

R. J. Weatherill, clerk, will receive tenders for grading and brushing in the Rural Municipality of Minitonas, until June 15.

Moncton, N. B.

Tenders for waterworks extensions costing between $20,000 and $30,000 will be called by the City about June 20. S. B. Anderson, clerk.

Tenders for sewers for Gordon St., from High St. to Cornhill St., will be called by the City shortly. J. Edington, engineer.

Concrete sidewalks on Elm St., William to Queen St., will be laid by the city by day labor.

Montreal, Que.

Sewers will be laid by the City on Dandurand and Rouen Sts. by day labor. S. Fortin, engineer.

Newmarket, Ont.

At a cost of about $4,675 the Town Council will have sewers laid on several streets. P. J. Anderson, clerk.

Odessa, Ont.

Reports state that the Provincial Government plans to construct a new thirty foot roadway through the village, extending easterly for a distance of 3,900′.

Ottawa, Ont.

The City has decided to pave the Cumming's Bridge approach, 2,000 sq. yds., at a cost of $5,000. The work will be done by day labor.

Re-surfacing the asphalt pavement on Sparks St., from Bank St. to Wellington St., is proposed by the City. A. F. Macallum, engineer.

Owen Sound, Ont.

Pavements and sidewalks on various streets, costing about $75,000, are contemplated by the Council. D. H. Fleming, engineer.

Tenders are being received by the City for the construction of approximately 5,000 lineal feet of sewers.

Pembroke, Ont.

An extension to the waterworks system is contemplated by the Town Council. J. P. Howe, engineer.

Port Colborne, Ont.

The Provincial Government, Department of Public Health, has ordered Port Colborne to take steps at once to install a modern waterworks system. It is estimated that the plant would cost $75,000. This would include a new intake, filtration plant and pumps.

Quebec, Que.

The Provincial Government will receive tenders until June 22 for liquid bitumen, for the following roads: Village of Amiante, 5,091 ft.; Thetford township, 8,594 ft.; St. Antoine de Portbriand, 9,181 ft. and the village of Aubèrtsonville, 7,871 ft.

Regina, Sask.

C. H. McManus, Moose Jaw, has the general contract for sewers and watermains for the City at $9,117. D. A. R. McCannell, City Engineer.

St. Jerome, Que.

Tenders will be called shortly by the Town Council for concrete sidewalks.

The Town Council contemplates surfacing a macadam road with asphaltic oil. A. P. Laplante, secretary.

St. Raymond, Que.

The general contract for a waterworks system for the town, estimated to cost $250,000 has been awarded to J. A. Auclair, Monument, Que.

Teeswater, Ont.

The Council is considering the paving of a portion of the main street with bitulithic pavement at a cost of $30,000.

Thorold, Ont.

Town Council proposes to have a relief outlet sewer costing $1,600 constructed on Regent St. from Ormond St. to the old Welland canal. D. J. C. Munro, clerk.

Toronto, Ont.

The Northern Development Branch of the Provincial Government has decided to lay a bituminous top on a section of the Sault-Toronto highway, one mile long.

C. Alfred Maguire, Chairman of the Board of Control, will receive tenders for laying waterpipes on several streets until June 19. Specifications are at Room 320, City Hall.

Truro, N. S.

Concrete pavements for Forester St. are proposed by the Town Council. The roadway will be 18 ft. wide and the sidewalks 700 ft. long. J. G. Campbell, engineer.

Verdun, Que.

The City may decide to pave Hickson and Regina Sts., from Verdun Ave. to Lasalle road.

An extension to the waterworks system, costing $12,000, may be made by the City.

Grading and macadamizing several streets, at a cost of $26,000, is being considered by the City Council.

During the summer the City will lay 16 in. watermains on Rielle St., from Lasalle Rd. to Verdun Ave., at a cost of $25,000.

The City Council proposes to have Wellington St. paved, between Willibrods and Woodland Sts., at a cost of $70,000.

Waterloo, Ont.

The Council contemplates the paving of Duke, George, Willow, Hearst and Park Sts. J. C. Haight, clerk.

West Flamboro, Ont.

West Flamboro Township Council proposes to lay a concrete sidewalk on Governor's Road, from Creighton's Road to Bertram's House. Clerk, Mrs. A. Corman, West Flamboro.

Winnipeg, Man.

Thos Jackson & Sons, 370 Colony St., Winnipeg, have a contract for granolithis walks for the City costing $2,779.50.

CONTRACTS AWARDED

Fredericton, N. B.

Contracts for roadwork awarded by the Provincial Government are as follows; 39—Parker Currier, Grey St., Fredericton, $22,000; 40—Concrete Builders Ltd., Fredericton, $58,000; 41—Guilford Hammond, Burden, N. B., $30,000; 42—Concrete Builders, Ltd.

Leamington, Ont.
Chick Contracting Co. Ltd., Windsor, has the contract for paving the 1st concession road from Erie St. to the Bevel line, for Essex County, with reinforced concrete.

Lindsay, Ont.
Victoria County Council has awarded Frank King & Son, Lindsay, the following road contracts: Fenlon Falls, $7,895; Bobcaygeon, $24,305; Victoria County, $9,110.

Peterborough, Ont.
John Carroll, 507 Bolivier St., has the contract for 1,600 sq. yds. of concrete pavement for the City. R. H. Parsons, engineer.

Quebec, Que.
The Provincial Government has awarded T. E. Rousseau Ltd., St. Valier St., Quebec, the general contract for 42,003 ft. on the Levis-St. Lambert highway, at St. Antoine de Tilly, at $147,000.

The Department of Highways of the Province of Quebec has signed contracts as follows for the repair work necessary to macadam roads: Three contracts to St. George and Garveau, 127 Stanley St., Montreal, for sections of the Iberville-St. Albans road, to cost respectively, $19,236, $13,512, $25,200, and to the same company two contracts for the Montreal-Laurier road to cost $14,160 and $4,036; the Kennedy Construction Co., 310 Shaughnessy Building Montreal, has contract for a section of the Montreal-Toronto road at $25,535; O'Connor Bros., Huntingdon, have the contract for a section of the Caghnawaga-Malone road at $6,111; Thomas Desbiens, Chambord, Lake St. John County, Lake St. John Road, three sections at $24,366, $17,634 and $18,912 respectively.

Regina, Sask.
Dominion Lime & Coal Co., 1723 Rose St., will supply the City with sewer pipe and other materials, costing $5,188.50.

The Provincial Government has awarded E. Smith, Melleville, the contract for the improvement of a road from Neudorf, east. J. B. Holfeld, Dafoe, has the contract for the improvement of a road from Dafoe, north-west.

St. John, N. B.
The acceptance of the following tenders has been moved by the City Council: Phoenix Foundry Co., 11½ tons of castings at 5½ cents per lb.; General Supply Co., 562.8 tons of cast iron pipe at $54.50 class B and 157.3 tons at $53.68 class C; T. McVity & Sons, for 3 in. x 12 in. gate valves at $63.50, 8 in. x 8 in. gate valves at $28.22, 2 in x 6 in. gate valves at $17.00; J. T. Farmer, 4 in. x 24 in. gate valves at $230, 1. in x 20 in. gate valves $161.

Sandwich, Ont.
The contract for the construction of a reinforced concrete pavement, two miles long, in Sandwich township, has been awarded to Pettipieces Ltd., Amherstburg, Ont.

Toronto, Ont.
The City has awarded the following contracts for sewers: Grant Contracting Co., 50 Front St. east, $770; Licastro Bros., 1423 Dufferin St., $1,257; W. E. Taylor, 22 Falcon St., $1,297; Commissioner of Works, City Hall, $5,515.

Contracts for pavements awarded by the City of Toronto are as follows: Asphaltic Concrete—Godson Contracting Co. Ldt., Manning Chambers, $14,073; asphaltic concrete and brick block—Kilmer & Barber, 24Adelaide St. West, $9,100 asphalt surface. Godson Contracting Co., $8,258; asphaltic pavement, Godson Contracting Co., $31,321, Kilmer & Barber, $15,388, Construction & Paving Co., Confederation Life Bldg., $58,305; Commissioner of Works, $5,112; bitulithic—Warren Bituminous Paving Co. of Ontario, Ltd., University Ave., $45,827; brick block—Grant Contracting Co. Ltd., 50 Front St., $6,972; concrete pavement, Ramsay Construction Co., 39 Indian Cres., $8,283; concrete sidewalks, A. Johnson, Fairmount Cres., A. E. Jupp Construction Co., 170 Berkley St., Murphy Contracting Co., Wychwood Park, National Contracting Co., Garnock Ave. and D. Mackay, 287 Ashdale Ave.; granite block surface—Grant Contracting Co., $13,455.

Vernon, B. C.
The City has commenced the installation of a waterworks plant costing $30,000. The work is being carried out by the City under the supervision of the Superintendent of Works.

Victoria, B. C.
De Wolf & Ham Construction Co. Ltd., Cranbrook, have the contract for a section of the Goatfell-Creston road, for the Provincial Government, which will cost about $24,500. J. G. Edwards, clerk.

Williamstown, Ont.
The Charlottenburg Township Council has awarded Oliver Major, Williamstown, a contract for gravelling the 7th concession road, from McGillivray's side road westerly, at $1.25 per cu. yd.

Winnipeg, Man.
C. Elasser & Sons, Winnipeg, will lay sewers for the City costing $5,177. C. J. Brown, City Clerk.

The City has awarded a contract for sewerage supplies to the Winnipeg Foundry Co., Winnipeg, at $5,597.

Railroads, Bridges and Wharves

Rockwood, Ont.
A. J. Aldous, Clerk of Eramosa Township, will receive tenders for the construction of a 34 ft. beam span bridge and a 40 ft. girder span bridge, until June 18. A. W. Connor & Co., Toronto, engineers.

St. Catharines, Ont.
Plans for improvements to the N. S. & T. railway throughout the Niagara peninsula call for expenditures totalling $2,300,000. Of this sum it is estimated that about $300,000 will be required for the building of a new terminal in St. Catharines.

Toronto, Ont.
Norman McLeod Ltd., Kent Bldg., has tendered on contracts Nos. 983 and 1011, for the construction of a bridge for the Provincial Government across the Humber River in Etobicoke Township. The contractor desires prices on 12,000 bbls. of cement and for hauling 8,000 cubic yards of stone and 4,000 cubic yadrs of sand, from the nearest railway to the site of construction.

Victoria, B. C.
It is the intention of the Provincial Government to make repairs to culverts in the Esquimalt and Sannich districts, at a cost of about $9,608.

Winnipeg, Man.
A despatch states that J. D. McArthur, Winnipeg, head of the Fort Alexander Railway Co., has concluded negotiations peg, will receive tenders for the construction of water supplies and pipe line at Avonlea, mile 50.9 Avonlea Subdivision, and at Kipling, mile 207, Glenavon Subdivision, Saskatchewan. Line revision and retaining wall at mile 1573.3 Bulkley Subdivision, B. C., and line revision, mile 32 to 35.65, Kashabowie, Subdivision, Ont.

CONTRACTS AWARDED

Chateauguay, Que.
W. E. Poulin, Marieville, has been awarded the general contract for a bridge 182 ft. long, by the Town Council, costing $42,700.

Guelph, Ont.
Wellington County Council has awarded the following contracts for bridges: Mount Forest Bridge—$12,000—John Tilker, Harriston; Auger's Bridge and Creekbank Bridge—$5,500—Charles Mattin, Fergus; Hagarty, Jordan and Schmidt Bridges—$6,200—E. Simmons, Drayton; 35 ft. truss, Erin—$2,000—W. Vallery, Belwood; Grading for Auger's Bridge—$1,915 and Mount Forest Bridge —$10,500, Walter Davies, Stratford.

Newton, Ont.
Mornington Township has awarded Stratford Bridge & Iron Works, Stratford, the contract for a steel bridge costing $2,565. Abutments will be erected by John Bellah, c/o W. J. Zoeger, clerk, at $540

North Bay, Ont.
Hill, Clarke & Francis, New Liskeard, have been awarded the contract for the T. & N. O. station at North Bay. This station will be two storeys high, brick construction.

Regina, Sask.
The John Kenward Co., Regina, have the general contract for a concrete bridge for the Provincial Government at North Gravelbourg, at $4,815.40.

The Provincial Government has awarded the contract for a concrete bridge, at Chamberlin, to J. M. McRae, Regina, at $3,315.40

Ste. Marie de Monnoir, Que.
The City has awarded Maynard & Hubert, Marieville, the general contract for "Parent" bridge at $17,890. The contractors are in the market for materials.

Toronto, Ont.
The Provincial Government, Department of Lands and Forests, has awarded the contract for a 100 ft. steel span class

"B" bridge, to the Hamilton Bridge Co. Ltd., Bay St. North, Hamilton, at $4,160. This company will also build a 90 ft. steel span bridge costing $3,940 for the Government.

Public Buildings, Churches and Schools

Brantford, Ont.
The Separate School Board will shortly call for tenders for the construction of a $75,000 brick school, containing eight rooms.

Brooklin, Ont.
School Section No. 3, Whitby Township, has had plans prepared for a school costing $36,000. The building, which will be two storeys high, will be 103 ft. x 36 ft., containing six class rooms. E. E. Patterson, Brooklin, chairman.

Gravenhurst, Ont.
Bulk and separate tenders for the construction of a $50,000 school, two storeys, eight rooms, steel and brick, will be received by the School Board until June 23. W. J. Leigh, chairman

Hamilton, Ont.
The construction of a morgue, near the central Police Station, is contemplated by the City Council.

Lawrencetown, N. S.
Tenders will be called shortly by F. H. Longley, secretary, for the construction of a school costing $20,000. L. R. Fairn, Aylesford, architect.

Lawrenceville, Que.
It is reported that brick, lumber and roofing, for a $35,000 church and presbytery have not yet been purchased. Rev. O. Robin, interested.

MacTier, Ont.
Plans are being prepared by P. J. O'Gorman, Stafford Block, Sudbury, for an extension to the Public school, which will cost $15,000.

Moncton, N. B.
Tenders will be received from June 15 to June 30 by the Sisters of Providence for the construction of a hospital costing, when complete, about $250,000. R. A. Frechette, 30 Bonaccord St., architect.

Ottawa, Ont.
Tenders for the erection of a small hospital on the Blackfoot Indian Reserve, Alberta, will be received by the Department of Indian Affairs, Ottawa, until June 21. Duncan Scott, Ottawa, secretary.

St. Thomas, Ont.
Plans have been prepared and tenders will be called shortly for a two storey, 80 ft. x 100 ft., market building, costing $55,000. W. C. Miller, engineer.

St. Hyacinthe, Que
S. R. Richer, architect, 240 Girouard St., has prepared plans for a four room school to cost $25,000. As soon as plans have approved tenders will be called.

Springhill, N. S.
Plans will be prepared for the Public School Board, by L. Allen, architect, Amherst, for a school costing $30,000. Tenders will be called shortly.

Toronto, Ont.
A deputation from the central council of ratepayers recently waited on the Board of Education and asked that the item for $450,000 High School, to be erected west of Yonge St., be re-inserted in the estimates.

Plans prepared by Molesworth, West & Secord, for the new Parkdale Canoe Club have been approved by club members. These plans call for an expenditure of about $125,000. The new structure will be 80 ft. x 100 ft., with two wings, each 60 ft. x 100 ft.

Plans are being prepared for the City for an addition to the Hospital of Incurables, 130 Dunn Ave., by E. J. Lennox, 362 Bay St. The work may commence in the fall.

Separate or bulk tenders for masonry, carpentry, metal work, plumbing, hot water heating, wiring and fixtures, plastering and painting, for shelter buildings in Willowvale Park, will be received by the City until June 19.

Windsor, Ont.
All sub-trades for a church costing $30,000 will be let. Rev. A. R. Hill, 1000 Ouellette Ave., has charge of construction.

CONTRACTS AWARDED

Brantford, Ont.
The plumbing contract for the addition to the collegiate has been awarded to Anguish & Whitfield, 46 Colborne St. F. McQuillan, 106 Queen St., has painting and glazing contracts. Asphaltic mastic flooring will be supplied by W. A. Moffat Co., Toronto.

John English, c/o Rev. W. Schofield, 23 Terrace Hill, has been awarded the contract for an 87 ft. x 63 ft. brick and steel church for the Methodist congregation, at $33,330.

Galt, Ont.
The Board of Education has awarded the following contracts for the addition to the Collegiate: Carpentry, C. Hammell, 59 Lincoln Ave.; plumbing, heating, ventilating, Drake-Avery Co., 103 St. John St., Hamilton; reinforced steel, Lefroy Engineering Co., Leader Lane, Toronto; sheet metal and plastering, E. J. Curry, 146 King St. West, Toronto.

Hull, Que.
Georges St. Laurent, 280 Montcalm St., Hull, has the general contract for a school for the Catholic School Commission, at $6,250. The heating contract has been let to St. Cyr & Tessier, 66 Notre Dame St., Hull at $1,472.55.

Montreal, Que.
F. X. Robillard & Co., 126 Cadillac St., has the general contract for St. Hermengilde Church, costing $60,000. Architects, Cardinal & Beauchamp, 26 St. James St.

Mount Rolland, Que.
Jos. Filion, 2479 St. Dennis St., Montreal, has the general contract for a school costing $33,000. The contracts for steel, roofing, electrical work, plumbing, heating and brickwork will be let. Materials have not yet been purchased.

North Burnaby, B. C.
Ward & Leverington, 131—11th Ave., New Westminster, has been awarded the general contract for North Burnaby High School costing $30,075.

Ottawa, Ont.
Bate Mahon Co., Central Chambers, general contractors, will erect the $40,000 addition to the Collegiate.

The contract for roofing the main building at the Exhibition Park, requiring 50,000 sq. ft. of galvanized iron, has been awarded by the City to McKinley & Northwood, 52 Rideau St.

St. Jerome, Que.
Sketch plans are being prepared for alterations to a church owned by the Roman Catholic Congregation. These alterations will cost about $75,000. J. E. C. Daoust, 180 Rue St. Jacques, Montreal.

Ste. Leon de Standon, Que.
Eastern Canada Steel & Iron Works, Lesage Ave., Quebec, has the contract for steel for the church. Victor Cote, Limoilou, will supply the cut stone.

Toronto, Ont.
The Board of Education has awarded the following contracts for the construction of Earl Haig School: Masonry, $23,494, H. Lucas & Son, 141 Havelock St.; steel, $3,695, Reid & Brown, Structural Steel & Iron Works Ltd., Esplanade east; carpentry, $18,660, Hudson & Moseley, 6 Algonquin Ave.; roofing, $812, J. T. Fowler, 200 Markham St.; plastering, $4,900, R. C. Dancy, 57 Kendall Ave.; plumbing and heating, $7,765, W. G. Edge, 47 Richmond St. East; ventilating, $3,664, A. W. Carmichael, 918 Palmerston Ave.

Norman McLeod, Kent Building, has the general contract for a four room school for S. S. 10, Scarboro township, at $53,000. Burden & Gouinlock & Carter, Toronto, architects.

Business Buildings and Industrial Plants

Brantford, Ont.
P. H. Secord & Sons, Construction Co. Ltd., 133 Nelson St., have the contract for a $50,000 factory for Industrial Realty Co., c/o A. A. Ludlow, City Hall.

Brockville, Ont.
Plans are being prepared by the Dominion Realty Co., Toronto, for a branch bank building for the Canadian Bank of Commerce, Toronto. The new building, which will replace that destroyed by fire, may be built this year.

Chicoutimi, Que.
Ludger Pearson, Chicoutmi, is excavating for a three storey building 41 ft. x 150 ft., to contain a store and dwellings.

Delaware, Ont.
W. E. Pincombe, secretary of the Masonic Temple, will receive tenders for the supplying of materials and the erection of a Masonic temple, until June 20.

Halifax, N. S.
A grain elevator, here, is contemplated by the Dominion Government, Department of Public Works, Ottawa. R. C. Desrochers, Parliament Buildings, Ottawa, secretary.

Montreal, Que.
Federal Construction Co., 329 Ontario St., have not yet let the following con-

(Continued on page [illegible])

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

TOWNSHIP OF VAUGHAN

Tenders for Bridge

Sealed tenders, plainly marked as to contents will be received by the undersigned up to

Thursday, 12 o'clock Noon, June 21st, 1923,

for the construction of a Reinforced Concrete Truss Bridge, over the Humber River, on the sideroad between Lots 30 and 31, Con. 9, Township of Vaughan.

The lowest or any tender will not necessarily be accepted.

Plans and specifications may be seen at the office of the undersigned, 45 Jarvis Street, Toronto.

FRANK BARBER,
Township Engineer.

FRANK BARBER AND
ASSOCIATES LIMITED,
Consulting Engineers,
45 Jarvis Street,
Toronto.

Toronto,
June 9th, 1923.

COUNTY OF HALDIMAND

TENDERS
For Concrete Bridges

Sealed Tenders, plainly marked as to contents, will be received by Harrison Arrell, K.C., Caledonia, up to 12 o'clock noon of

Wednesday, June 20th, 1923,

for the construction of the following bridges:

Bridges to be built on Empire Side Road (Darkey Side Road)

(a) 12′ Concrete Bridge ¼ mile east off Provincial Road 24, between Lot 12, Concession 3 and Lot 12, Concession 4, Seneca.
(b) 14′ Concrete Bridge opposite farm of James Scott between Lots 12 and 13, Concession 4, Seneca.
(c) 8′ Concrete culvert opposite farm of John Hall between Lots 12 and 13, Concession 4, Seneca.
(d) 6′ Concrete Culvert 1/8 mile south of farm of Norman Gorley between lots 12 and 13, Concession 5, Seneca.
(e) 6′ Concrete Culvert south of Wentworth line between lots 12 and 1, Concession 5, Seneca.

6′ Concrete Culvert on town line between lot 24, Concession 7, Walpole and Lot 1, Concession 7, Rainham.

18′ Gee Bridge on Town line between lot 23, Concession 10, Walpole and Lot 55, Concession 1 North Cayuga.

Plans and Specifications may be seen at the office of the undersigned or at their branch office at Dunnville, E. Hinchliffe, Resident Engineer, or at the office of County Superintendent, David McBurney, Hagersville.

The lowest or any tender will not necessarily be accepted.

FRANK BARBER AND
ASSOCIATES LIMITED
County Engineers,
45 Jarvis Street,
Toronto.

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RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

TOWNSHIP OF MINTO

TENDERS
for Municipal Drains

Sealed tenders will be received by the undersigned up to noon of

Monday, June 18th, 1923,

for the construction of Municipal Drains Nos. 11 and 12 in the Township of Minto, consisting of 23814 cub. yds. of excavation for open ditches and 2342 lineal feet of tile drains.

Plans, profiles and specifications may be seen at the office of the undersigned, Harriston, Ont.

A marked cheque on a chartered bank or a Guaranty Company's bond for 7 per cent of the amount of the tender will be required when the Contract is signed.

The lowest or any tender not necessarily accepted.

W. D. McLELLAN,
Clerk of the Township of Minto.
Harriston, Ont.

23-24

TENDERS
for Shelter Building

Separate or bulk tenders for the work included in the specifications of the trades mentioned below in connection with the erection and completion of a shelter building in Willowvale Park, will be received by registered post only addressed to the undersigned, up to 12 o'clock noon on

Tuesday, June 19th, 1923,

1. Mason Work.
2. Carpentry Work.
3. Metal Work.
4. Plumbing.
5. Hot Water Heating.
6. Wiring and Light Fixtures
7. Plastering.
8. Painting.

Envelopes containing tenders must be plainly marked on the outside as to contents. Plans and specifications may be seen and forms of tender and all information obtained at the office of the City Architect. The usual conditions relating to tendering as prescribed by City By-laws and on form of tender must be strictly complied with, or tenders may not be entertained. Tenderers shall also submit with tender the names of two personal sureties or surety company approved by the City Treasurer.

The lowest or any tender not necessarily accepted.

C. ALFRED MAGUIRE (Mayor),
Chairman, Board of Control.

24

TOWN OF OSHAWA

Board of Water Commissioners

Tenders for
500,000 Imperial Gallon Water Tower

Sealed tenders plainly marked, will be received by the undersigned until 5 o'clock p.m.

Monday, June 25th, 1923,

for the construction of a 500,000 Imperial gallon steel water tank, 110 ft. high to high water mark.

An accepted cheque for $500.00 must accompany tender.

All necessary information may be obtained at th office of the Town Engineer, Oshawa, Ont.

The lowest or any tender not necessarily accepted.

W. C. SMITH,
Town Engineer,
Oshawa, Ont.

24

PROVINCE OF SASKATCHEWAN

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 19, Section B—subsection (b)" will be received by the undersigned until eleven a.m. standard time on

Wednesday, June 27th, 1923,

for the excavation of approximately 34,500 cubic yards of earth and other work required in the construction of Provincial highway from Hodgeville South, 10 miles.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:—

W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.; E. W. Grainger, Sec-Treas. R.M. No. 135, Hodgeville, Sask.

An accepted cheque for the sum of $700.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of three p.m. standard time, on Wednesday, June 27th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.

Department of Highways,
June 6th, 1923.
Regina, Sask.
June 6th, 1923

24

Tenders for Dredging

Sealed tenders addressed to the undersigned and endorsed "Tender for dredging," Port Arthur or Fort William, Ont., as the case may be, will be received until 12 o'clock noon (daylight saving)

Wednesday, June 20th, 1923,

for dredging required at Port Arthur, Ontario, and at Fort William, Ontario.

Tenders will not be considered unless made on the forms supplied by the Department and according to conditions set forth therein.

Combined specification and form of tender can be obtained on application to the undersigned, also at the offices of the District Engineers, Custom House Building, Fort William, Ontario, and Equity Building, Toronto, Ontario. Tenders must include the towing of the plant to and from the work.

The dredges and other plant which are intended to be used on the work shall have been duly registered in Canada at the time of the filing of the tender with the Department, or shall have been built in Canada after the filing of the tender.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, for 5 p.c. of the contract price, but no cheque to be for less than fifteen hundred dollars. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, June 1st, 1923. 23-24

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 4, Section F" will be received by the undersigned until eleven a.m. standard time on

Wednesday, June 27th, 1923,

for the excavation of approximately 70,000 cubic yards of earth and other work required in the construction of Provincial highway from Regina to Pense, 17½ miles.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:—

W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.

An accepted cheque for the sum of $1,000.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of three p.m. standard time, on Wednesday, June 27th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways,
Regina, Sask.
June 6th, 1923 24

CONTRACTORS

Tenders will be received until June 22nd, 1923, for the erection of a church building on Shaw street, for the Reformed Episcopal Church.

Plans may be seen or obtained on deposit of $10 refundable on return within time agreed.

The lowest or any tender not necessarily accepted.

GORDON & HELLIWELL, Architects,
Confederation Life Building,
24 TORONTO.

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 28, Section A—subsection (b)" will be received by the undersigned until eleven a.m. standard time on

Wednesday, June 27th, 1923,

for the excavation of approximately 38,600 cubic yards of earth and other work required in the construction of Provincial highway from Tisdale north, from the north east corner of Section 18, township 47, range 14, to the north-east corner of Section 32, township 48, range 14, West of the Second Meridian—10 miles.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:—

W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.; S. A. M. Godfrey, Sec-Treas. R.M. No. 427, Tisdale, Sask.

An accepted cheque for the sum of $700.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of three p.m. standard time, on Wednesday, June 27th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways,
Regina, Sask.
June 6th, 1923 24

FOR SALE

Electric Travelling Cranes and Steel Crane Runways

STEEL CRANE RUNWAY—382 ft. long; height of columns 30 ft.; weight about 150 tons. Used for 15-ton Crane 80 ft. span.

STEEL CRANE RUNWAY—220 ft. long; height of columns 23 ft. Also 22 additional Girders each 20 ft., without columns, sufficient to extend Runway 220 feet additional. Total weight about 50 tons. Used for 10-ton Crane 70 ft. span.

These runways can of course be used for any width of crane desired. Can furnish blueprints showing construction.

Ask for prices and further particulars, also a complete list of our second hand machinery.

The Maritime Bridge Co., Ltd.
21 New Glasgow, N.S.

Tenders Wanted

Tenders will be received up to 4 P.M.

June 18th, 1923,

for either TARVIA, CEMENT, ASPHALT or BITULITHIC, pavement on Clinton Street in the Village of Teeswater, estimated length 3140 ft, width inside 6" curb 34'.

Coarse gravel can be had at town pit free and limestone at an estimated cost of $1.00 per cu. yd.

Tender to include 15 catch basins, excavation, drainage and everything complete. Sealed tenders received by—

W. H. LOGAN, Clerk,
24 Teeswater, Ont.

Tenders Wanted

BOARD OF EDUCATION

Sealed tenders addressed to the Business Administrator and Secretary-Treasurer, Board of Education, Administration Building, 155 College St., endorsed with the word "Tender" and also with the name of the school building and trade or article to which it relates, will be received until

Tuesday, June 19th, 1923,

for

(1) **Masonry, Structural Steel, Carpentry, Plumbing, Heating, Ventilation, Oil Burning Equipment, Electric Wiring, Time Clock and Programme Systems, Time and Programme Clocks, Local Telephones for RIVERDALE COLLEGIATE.**

(2) **Plastering for LESLIE GARDENS SCHOOL.**

Specificatons and conditions of tendering may be seen and all information obtained at the office of the Architect of the Board, 155 College St., Telephone Trinity 8200.

Tenders must be in the office of the Secretarial Department at the Administration Building, 155 College St., **not later than 4 P.M. on the day** named, after which no tender will be received.

The lowest or any tender will not necessarily be accepted.

W. W. PEARSE,
Business Adminstrator and Secretary-Treasurer.
H. L. KERR,
Chairman Property Committee,
24 Pro Tem.

Auction Sale

There will be offered for sale by public auction on **Wednesday, the 20th day of June, 1923,** at the hour of 1 o'clock in the afternoon, at the premises of John H. Nelles, in the Village of Caledonia, the following property, viz.:

20-40 H.P. Sawyer-Massey Tractor.
36-48 H.P. Waterloo Separator.
Feeder.
Weigher.
Stacker.
Chaff Blower.
1 Victor Clover Mill and equipment.
TERMS Cash.

For further particulars and conditions of sale apply to MESSRS. JOHN NELLES & SON.
Dated at Caledonia, this 23rd day of May, 1923.
21

CONTRACTORS—Superintendent or General Foreman requires position. Life long experience. Thorough practical knowledge of Unit costs and supervision. Excellent references. Will go anywhere. Box 282, Contract Record, Toronto.
23-26

COUNTY OF PEEL

Tenders for Grading

[illegible] [illegible], marked as to contents, [illegible] the undersigned up to noon,

Saturday, June 23rd, 1923,

[illegible] 8000 cubic yards of grading [illegible] [illegible], near the Toronto Milling [illegible] [illegible] of Streetsville.

[illegible] [illegible] may be seen at the [illegible] [illegible] Milling Company, Streetsville, or at the Court House in Brampton.

The lowest or any tender not necessarily accepted.

Sgd. N. L. POWELL,
Peel County Road Superintendent.

WANTED—Designer of Structural Steel and [illegible]. Railway experience necessary. Box [illegible] Contract Record, Toronto. 24-25

POSITION WANTED by first class, practical sheet metal worker, all branches, good [illegible] estimator. Box 284, Contract Record, Toronto. 24-25

REINFORCED CONCRETE GENERAL SUPERINTENDENT wants position on Buildings, Bridges or Elevators, can produce best results. Box 276, Contract Record, 21-24

A Service to the Profession

Every man wishing to tender must first see the plans and specifications.

If the plans are in Montreal and he is in Vancouver the inspection is a problem. We, however, with your assistance, are able to solve it. Place then on file at any or all of the offices of the "Contract Record" throughout the Dominion.

Contractors, engineers and allied manufacturers read the "Contract Record." It is the logical publicity medium for the announcement of tenders wanted.

Send us your plans. They will receive the best of care.

A room is reserved in each of our offices for examination of your plans by possible bidders.

Contract Record
and Engineering Review

Toronto - - - - 345 Adelaide St. W.
Montreal - - - - 119 Board of Trade Bldg.
Winnipeg - - - - - 302 Travellers' Bldg.
Vancouver - - - - - - 106 Winch Bldg.

Late News

Arthur, Ont.

The Provincial Highways Department has awarded the contract for abutments for a $45,000 concrete arch bridge to Callaghan & Pringle. c/o of the Department

Edward Gainer, clerk of Peel Township, will receive tenders until June 18 for the construction of three concrete bridges, specifications and location as follows: 16 ft. span, Concession 3, between lots 15 and 16; 10 ft. span, Concesson 8, opposite lot 15; 10 ft span, Concession 12, opposite lot 1.

Brampton, Ont.

Toronto Township has asked the County Council to have four new bridges built in the township. The Council is working on a project to extend the roads and bridges program.

Breslau, Ont.

Tenders for the construction of a bridge on the Natchey road in Waterloo Township, will be received until June 30 by Peter A. Snider, Clerk, Breslau.

Caledonia, Ont.

Harrison Arrell, K. C., Caledonia, will receive tenders until June 20 for the construction of the following bridges, in Haldimand County: (a) 12 ft concrete bridge ¼ mile east of the Provincial Road 24, between Lot 12, Concession 3 and Lot 12, Concession 4, Seneca. (b) 14 ft. concrete bridge opposite the farm of J. Scott, between Lots 12 and 13, Seneca. (c) 8 ft. concrete culvert, opposite the farm of J. Hall, between Lots 12 and 13, Concession 4, Seneca. (d) 6 ft. concrete culvert, 1/8 mile south of farm of N. Gorley, between Lots 12 and 1, Concession 5, Seneca. (e) 6 ft. culvert south of Wentworth line between 12 and 1, Concession 5, Seneca. Also a 6 ft. concrete culvert on the town line, between Lot 24, Concession 7, Walpole and Lot 1, Concession 7, Rainham; 18 ft. gee bridge on the town line between Lots 23, Concession 10, Walpole, and Lot 55, Concession 1 North Cayuga. Frank Barber and Associates, 45 Jarvis St., Toronto, engineers.

Hamilton, Ont.

The paving of Aberdeen Ave. has been decided upon by the works committee. Barton Township has agreed to share the cost. Tenders it is expected will be called as soon as the City Council has given the project its approval.

Montreal, Que.

The City has invited tenders for the construction of sewers on Patricia St. and Kilby St. June 19 is the closing date. Rene Bauset, clerk.

Ottawa, Ont.

Tenders or the constructon of a two and a half storey residence, 26 ft. x 34 ft. brick veneer, will be received until June 16 by Ernest Flexman, 830 Bank St.

Plans have been prepared for the City for a $30,000 Fire Station. It is expected that tenders for this building will be called within three weeks.

Tenders for the paving of Catherine St. with asphalt will be received by the City until June 26. This work will cost approximately $14,000. The City also intends to lay an asphalt pavement on Hilda St.

Ottawa City Council will receive tenders for the paving of Bank St., with asphalt, from Pretoria Ave. to Bank St. bridge, at an estimated cost of $183,000. June 26 is the closing date for tenders. N. H. H. Lett, clerk.

Port Lambton, Ont.

Store and residence owned by A. Ross was completely destroyed by fire. The loss is estimated at $40,000 Building will be re-built.

Quebec, Que.

Les Habitations de la Canardiere has awarded J. B. Verret & Fils, 149 3rd, Ave., Limoilou, the general contract for twenty residences, two storeys high, 20 ft. x 28 ft., concrete and brick, costing $82,000.

Plans are being prepared for the City by J. L. Pinsonnault, City Hall, for a Police Station, estimated to cost $18,000. The building will be of brick and concrete construction.

Toronto, Ont.

Tenders for laying 6-in. watermains will be received until June 19 by the Board of Control. Specifications may be obtained from Room 320, City Hall.

The City of Toronto will receive tenders for the construction of the following pavements until June 19: Asphalt, bitulithic, concrete curbings, concrete sidewalks. Further details may be obtained at the City Hall.

Sealed tenders for the construction ot a reinforced concrete truss bridge across the Humber River, in the Township of Vaughan, will be received by Frank Barber, Town Engineer, 45 Jarvis St., Toronto, until June 21.

Tenders for the constructon of 6-in. watermains on various streets in York Township will be received by F. B. Goedike, engineer, 40 Jarvis St., Toronto, until June 18.

F. B. Goedike, Township Engineer, 40 Jarvis St., Toronto, has submitted a report recommending a joint sewerage system for Scarboro and the eastern section of York Township. The estimated cost for trunk sewers is approximately $170,000. Of this amount York will pay $95,000 and Scarboro $75,000. The reeye suggested that the scheme should be worked out at once R. O. Wynne-Roberts will probably be named as consulting engineer.

Improving Greek Harbor

The Commissioner of the Port of Piraeus, Greece, has asked for proposals for the partial construction of the port works, designed to improve the harbor. The complete plans provide for a foundation wall about 2,750 meters in length, dredging of the harbor, docks, and dock facilities. Bids must be submitted by June 10, 1923. It is understood that in order to have bids considered it will be necessary to have local representation. A resume translation in English of the terms of the convention regarding the construction work, announcement of bids, wage chart, and specifications, in Greek, will be made available to American firms applying to the Bureau of Foreign and Domestic Commerce, Washington.

Science and Invention

For many generations munificent contributions have been made by wealthy men in great Britain to the cause of scientific research. The latest addition to this illustratious catalogue is the gift of one hundred thousand pounds by the famous shipbuilder Sir Alfred Yarrow to the Royal Society of Great Britain. This sum is for the endowmen of research and industry. Recently some notable awards have been made by British scientific institutions in recognition of distinguishing work in various directions. The Bessemer Gold Medal of the British Iron and Steel Institute has been awarded to Dr. Maw, LL.D., who is 85 years of age and is now President of the Institution of Civil Engineers. The Institution of Electrical Engineers has awarded the Faraday medal to Sir Charles Parsons for his pioneer work in connection with the steam turbine, which has revolutionized the production of electric power and the propulsion of large vessels.

Business Buildings and Industrial Plants

(Continued from page 53)

tract for a $500,000 office and warehouse building: Steel, roofing, electrical, plumbing, steam heating, brickwork, fire escapes, sprinkler system and probably art stone. Prices on all materials are invited.

Mount Dennis, Ont.
A syndcate is interested in the construction of a recreation building costing $25,000. The building will contain fifteen bowling alleys. A. E. Ramsay, Lipincott St., Weston, interested.

Renfrew, Ont.
Renfrew Flour Mills Ltd., will commence shortly to erect a $200,000 flour mill. The building will be 45 ft. x 60 ft., concrete and brick construction, with a metal roof. The work will be done by the company's staff.

Timmins, Ont.
Hollinger Gold Mines are having plans prepared by J. S. Archibald, Montreal, for an office building costing $35,000.

Toronto, Ont.
A departmental store, at the corner of Bay and Dundas Sts., may be erected by A. Brown & Co., c/o Symons and Sparrow, 319 Bay St., architects.

Contracts will be let for roofing, plastering, electric wiring, glazing, plumbing and heating for the factory being built for Bradshaw's Ltd., by W. J. Tremble, 54 University Ave.

Yarmouth, N. S.
It is reported that a syndicate has approached the Town Council regarding a fixed assessment on a proposed cold storage plant costing $57,000.

CONTRACTS AWARDED

Lindsay, Ont.
William Bros., William St., have the general contract for a factory for J. Horn Knitting Co., William St., north. The plumbing contract has been awarded to Boxall & Matthie, Kent St.

New Toronto, Ont.
W. A. Moffatt Co., 86 Don Esplanade, Toronto, has the roofing contract for the factory being erected for the R. N. Boxer Co., Toronto. Canadian Electric Co., 175 King St. east, has the electrical contracts. Contracts for painting and glazing will be let.

Oakville, Ont.
W. H. Hawkes, Oakville, has the general contract for a theatre costng $18,000. Contracts for plumbing and heating have not yet been let.

Ottawa, Ont.
Graves Construction Co., Jackson Bldg., Bank St., will erect a $14,000 warehouse for W. G. Edge Co. Ltd., Bank St. About 150,000 brick and 60 cu. yds. of concrete will be required.

Outremont, Que.
The following contracts have been awarded for the construction of an $80,000 apartment house, by Lous Berna, 1370 Bernard St. west, general contractor: steel, Dominion Bridge Co. Lachine; art stone, Canadian Hydro Stone Ltd., Montreal, East; Contracts for roofing, electrical work, plastering, marble, tile and fire escapes, will be let.

Stratford, Ont.
Stratford Bridge & Iron Works, Erie St., have the general contract for a warehouse for Kroeheler Mfg. Co., Ontario St., at $6,000.

Timmins, Ont.
The Dominion Bank, Toronto, has awarded the following contracts for the construction of a branch: Plumbing, heating, roofing and sheet metal, A. Grazeau, Timmins; plastering, J. W. McConeghy, Timmins.

Toronto, Ont.
Kalamein Windows for the warehouse being built here for Cassidy's Ltd., will be supplied by W. E. Dillion Co. Ltd., 187 George St., Toronto. Steel contract has been awarded to Vulcan Steel & Iron Works, St. Denis St., Montreal.

McGregor & McIntyre, Shaw St., are erecting the steel for the factory being built by W J. Trimble, 54 University Ave., for Bradshaw's Ltd.

H. B. Kennedy Construction Co., 151 Church St., has the contract for a garage costing $20,000 for Geller Bros., 228 Spadina Ave. Buildings occupying the site will be wrecked. New structure will be 46 ft. x 129 ft., steel and brick construction.

Residences

Guelph, Ont.
The Homewood Sanitarium of Guelph, Ont., Ltd., will receive tenders for the constructon of a nurses' home until June 25. A. P. Bell, bursar.

Hamilton, Ont.
Standard Construction Co., Gibson & Cannon Sts., intend to build a $10,000 residence , for two storeys high, brick construction.

Work will start immediately on a $10,000 residence for Dr. W. Ferguson, 837 Main St. The building will be two storeys high, 35 ft. x 33 ft., concrete and brick construction.

Iberville, Que.
. Plans are being prepared for a $10,000 residence for A. Regnier by J. T. Decarey, 5 Rue Jacques Cartier. Tenders will be called in July.

Montreal, Que.
I. Vantrin, Apt. 2, 1040 St Hubert St., will build a two storey resdence, 50 ft. x 102 ft., costing $25,000. Materals have not yet been purchased. Sub-trades may be let.

J. L'Archevesque, 2909 Lafontaine St., will let contracts for plumbing, wiring, plastering, etc., for a residence costing $30,000.

M. A. Lamarre, general contractor, 25 Bourgois St., is excavating for a $10,000 dwelling. All sub-trades will be let.

Roofing, electrical, plumbing, heating, plastering and brickwork contracts for a $12,000 residence will be let by N. Paquette, 2099 Jeanne d'Arc, builder.

Newcastle, N. B.
Northumberland County Hospital Board contemplated the erection of a nurses' home costing $10,000.

Outremount, Que.
L. Marquis, 233a Fabre St., invites tenders on roofing, electrical work, plumbing, heating, plastering, glazing and other trades necessary for the construction of a $10,000 residence.

St. Lambert, Que.
Tenders will be received until June 20 for the construction of a $10,000 residence by Victor Delage, St. Hyacinthe.

South Porcupine, Ont.
Dome Mines Co. Ltd., contemplate the building of residences costing $50,000 frame construction, about a mile from the town. H. P. De Pencier, manager

Three Rivers, Que.
A $12,000 bungalow will be built for Robert F. Grant, manager of the St. Maurice Lumber Co. Asselin & Denoncourt, architects, 42 Alexandre St. Materials not yet purchased. Sub-trades will probably be let.

Material for a $10,000 bungalow, which will be built by C. Grant, manager of the St. Maurice Lumber Co., has not yet been purchased . Asselin & Denoncourt, 42 Alexandre St., architects. Sub-trades will probably be let.

Toronto, Ont.
J. Mitchell, architect, 55 Isabella St., is receiving tenders on a $20,000 residence. The building will be two storeys high, stone and brick construction.

Plans are being prepared for a $10,000 two storey, 37 ft. x 34 ft., brick dwelling for Hugh Munro, Selby Apartments, Sherbourne St. J. Hunt Stanford & Son, Yongs St. Arcade, architects.

Verdun, Que.
V. St. Armand, 85 Rielle St., will let roofing, electrical and plastering contracts for a residence costing $12,000.

Windsor, Ont.
Contracts for electrical work, plumbing and plastering, for a residence costing $33,500, will be let by the general contractor, R. W. Leatherdale, 119 Moy Ave. Materials have not yet been purchased .

CONTRACTS AWARDED

Quebec, Que.
The general contract for a $23,000 residence for Hector Aymot, 45 Dalhousie St., has been awarded to Chrys. Jobin, 182 Latourelle St. The structure will be 40 ft. x 40 ft., brick construction.

Chrys Jobin 182 Latourelle St., has the general contract for a two storey residence, 35 ft. x 40 ft. costing $15,000. Helidore Lebarge, 103 St. John, St. architect.

Power Plants Electricity and Telephones

Guernsey, Sask.
Tenders are beng received by the Guernsey Rural Telephone Co. for the construction of an addition to the system. H. Recknell, Guernsey, manager.

Outremont, Que.
Louis Berna, general contractor, 1320 Bernard St., west has not awarded the

[illegible] for domestic telephones for an [illegible] apartment house.

Kidkland Lake, Ont.
Township of Teck may have a transmission line constructed along the government road from Swastika to Kirkland Lake, at a cost of $8,000. M. Campbell, clerk, Kirkland Lake.

Vancouver, B. C.
British Columbia Electric Railway has announced that it intends to increase the total turbine capacity of the company from 153,000 h.p. to 268,000 h.p. To carry out this project it is estimated would cost $10,000,000.

Verdun, Que.
A $9,000 extension to the city's lighting system is being discussed by the Council. J. E Noel, City Engineer.

CONTRACTS AWARDED

Shellbrook, Sask.
Rozilea Rural Telephone Co. Ltd., has awarded T. McVickers, 1002 McCallum Hill Building, Regina, the contract for extensions to the system.

Winnipeg, Man.
The Manitoba Telephone System, McDermott & Charlotte Sts., has awarded Pearson Burleigh, McIntyre Bldd., the contract for an exchange at Treherne costing $3,485 and one at Plum Coulee costing $3,175.

Miscellaneous

Ottawa, Ont.
The Dominion Government will receive tenders for dredging at Port Arthur and Fort William until June 20. R. C. Desrochers, Department of Public Works, Ottawa, secretary.

The Department of Interior, Ottawa, has called for tenders for fencing Elk Island Park, Alberta. The distance to be fenced is approximately twenty four miles. J. M. Roberts, secretary, will receive tenders until June 18.

Outremont, Que.
Louis Berna, 1320 Bernard St. west, general contractor for an apartment house costing $80,000, has not let the contracts for dumb waiters and elevators

Sault Ste Marie Ont.
Soo Falls Brewing Co., Bay St., will secure estimates on the cost of repairing a dock. Lang & Ross, 623 Queen St., engineers.

Toronto Electric Commission is receiving tenders for the purchase and wrecking of five houses on Nelson St.

Toronto, Ont.
Pipe Products Limited has been granted an Ontario Charter and will manufacture and deal in steel and metal pipe, plumbers' and steam fitters' supplies, and other metal goods. The capital is $1,150,000. Head Office is at Toronto.

Rislay Brick Co., Limited, has been incorporated under the Ontario Companies Act and will operate as builders and general contractors. The head office will be in Hamilton. Capital is $40,000.

Verdun, Que.
The City Council has before it a project for park improvements costing $25,000. J. E. Noel, engineer.

CONTRACTS AWARDED

Ottawa, Ont.
The general contracts for dredging Midland and Penetang harbors has been awarded to Robert Carson, Midland, by the Department of Public Works.

Fires

Hamilton, Ont.
Freight sheds owned by the Canada Steamship Lines, Toronto, were destroyed by fire. Loss is estimated at $5,000. The buildings will probably be rebuilt

Niagara Falls, Ont.
A store and warehouse owned by W. L. Fenwick, Bridge St., was recently destroyed by fire with loss of about $15,000. The buildings will be re-built.

Sussex, N. B.
Damage estimated at $200,000 was caused by a fire which swept thrugh the business section of the town, destroying several stores, two hotels and a branch bank.

Argentine to Build Roads

The Minister of Public Works of the Province of Buenos Aires, Argentine, has formulated plans that will put highway construction within the Province on a more organized basis. Highways will be divided into zones, each zone supervised by a zone chief, who will be provided with equipment and personnel for construction and repair work. The funds available have been limited to about 1,000,000 pesos ($370,000) a year but it is planned to levy a land tax to increase this amount.

We Issue Surety Bonds

for Contractors, for Public Highways, Contracts and all Municipal and private Corporation work.

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of Canada

FIDELITY AGENCY
OF CANADA
[illegible]

MacLean Reports Cover Canada

MacLean Building Reports will give you accurate, advance information on every building and engineering contract of consequence in the Dominion.

These reports are issued daily and reach subscribers in ample time to bid on the work or submit prices for the machinery, equipment, materials or supplies required.

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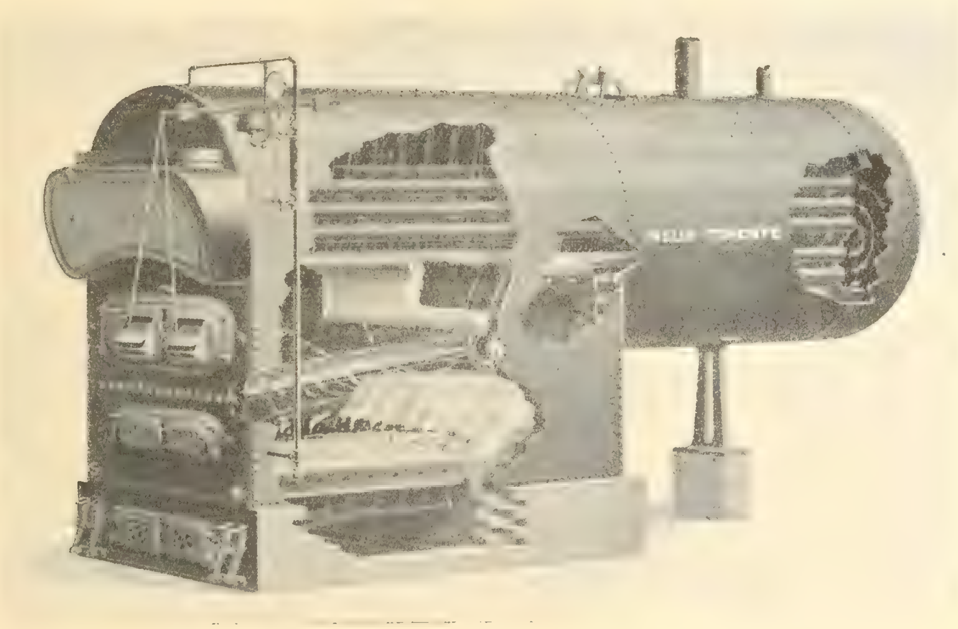

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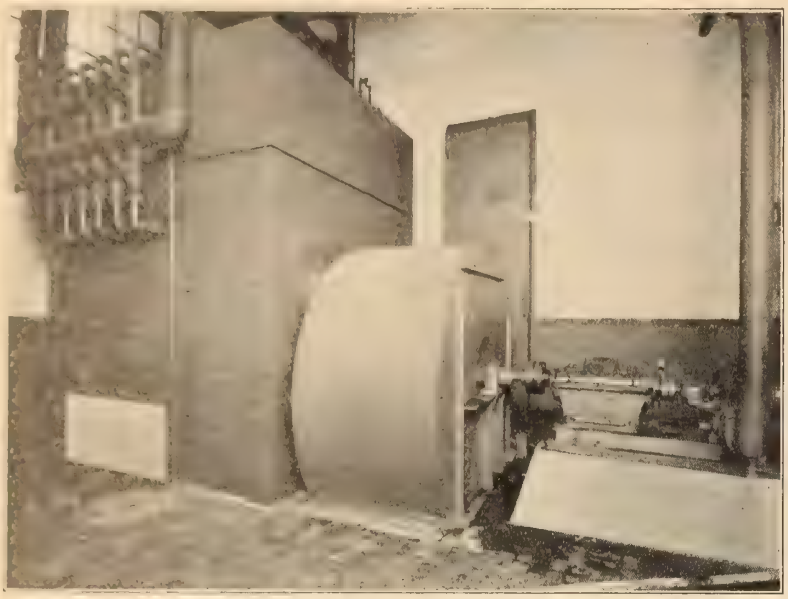

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Among the many petty annoyances of life are the bumps and jars arising from transport in vehicles which are imperfectly sprung. The elimination of such unpleasant concomitants of speed has been a special study of british engineers one of whom has recently devised a means of holding a strip of rubber between the turns of a helical steel spring. The india rubber, which is moulded in helical form and vulcanized, is provided with a flange or lip, which holds it in position with respect to the spring. The dimensions of the rubber are chosen so that it remains firmly placed whether the spring is loaded or not, and so that the rubber is normally subjected to slight compression. Under these conditions, the resilience of the spring and the softness of the rubber combine to eliminate all shock.

Hot Water by Electricity

Hot water at any hour of the day or night is a luxury well within the means of every householder thanks to recent developments in electric heaters. For many years it was assumed that electricity was hopelessly expensive as a means of providing large quantities of hot water, but persistent efforts by British manufacturers have led to the perfection of appliances which met all requirements. Varying widely in form and size according to individual requirements, these appliances have all the high efficiency and absolute cleanliness which is characteristic of electrical apparatus. The hot water is provided where it is wanted and there are no pipes to disfigure the walls and waste heat. The cost of the apparatus and the cost of the electricity consumed compare favorably with the costs of coal fired boilers, and the elimination of all attendance for lighting, stoking and cleaning is an important factor.

New Blueprint Method

Nothing is more familiar to the engineer in all parts of the world than the "blue print" which is taken from tracings of machine drawings. So familiar has it been for so many years that anything new in connection with it would hardly be considered possible. Nevertheless something new has actually been produced by a British photo-printing company. There have been in existence many kinds of machines for printing tracings, and also machines for drying prints after they have been developed; but until now there has been no satisfactory scheme evolved for mechanically washing the prints. The new device passes the prints continuously through a deep water tank, the prints being gripped between a woven wire belt and a set of fabric tapes. The belt is made of a non-corroding bronze wire and is so arranged that the prints go squarely through the machines and are not torn or damaged in the process. Ingenious arrangements have been devised to drain off most of the water and to squeeze out most of the remainder by means of a polished metal roller. After passing the machine, all that the prints need in order to be ready for service is the usual drying. The maximum speed of the machine is about 300 "double elephant" sheets per hour.

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A steel specification is a document for guidance to the manufacturer in producing an article, and a protection to the purchaser in accepting it. A specification should be written only after careful study of the production of the article, and an equally careful study of the use to which it is to be put.

Specification A-16-14, covering Rail Steel Bars, was issued by the American Society for Testing Materials only after the most careful investigation that has ever been made of any reinforcing material. In 1913, Professor W. K. Hatt, then of Purdue University (now on Mr. Hoover's staff), made over 3,000 tests on as many samples obtained under normal working conditions from four separate mills. Professor Hatt found that Rail Steel Bars had unusual strength, and furthermore, "excess ductility for its strength above usual grades of steel."

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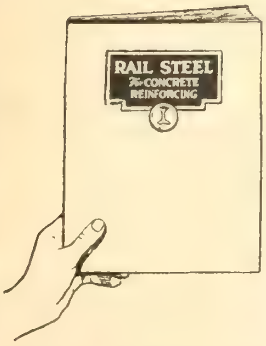

You will be interested in the facts contained in this valuable book. A copy is yours for the asking.

Burlington Reinforcing Bars used in construction of new Farmers Dairy Building, erected 1922. Toronto, Ont.

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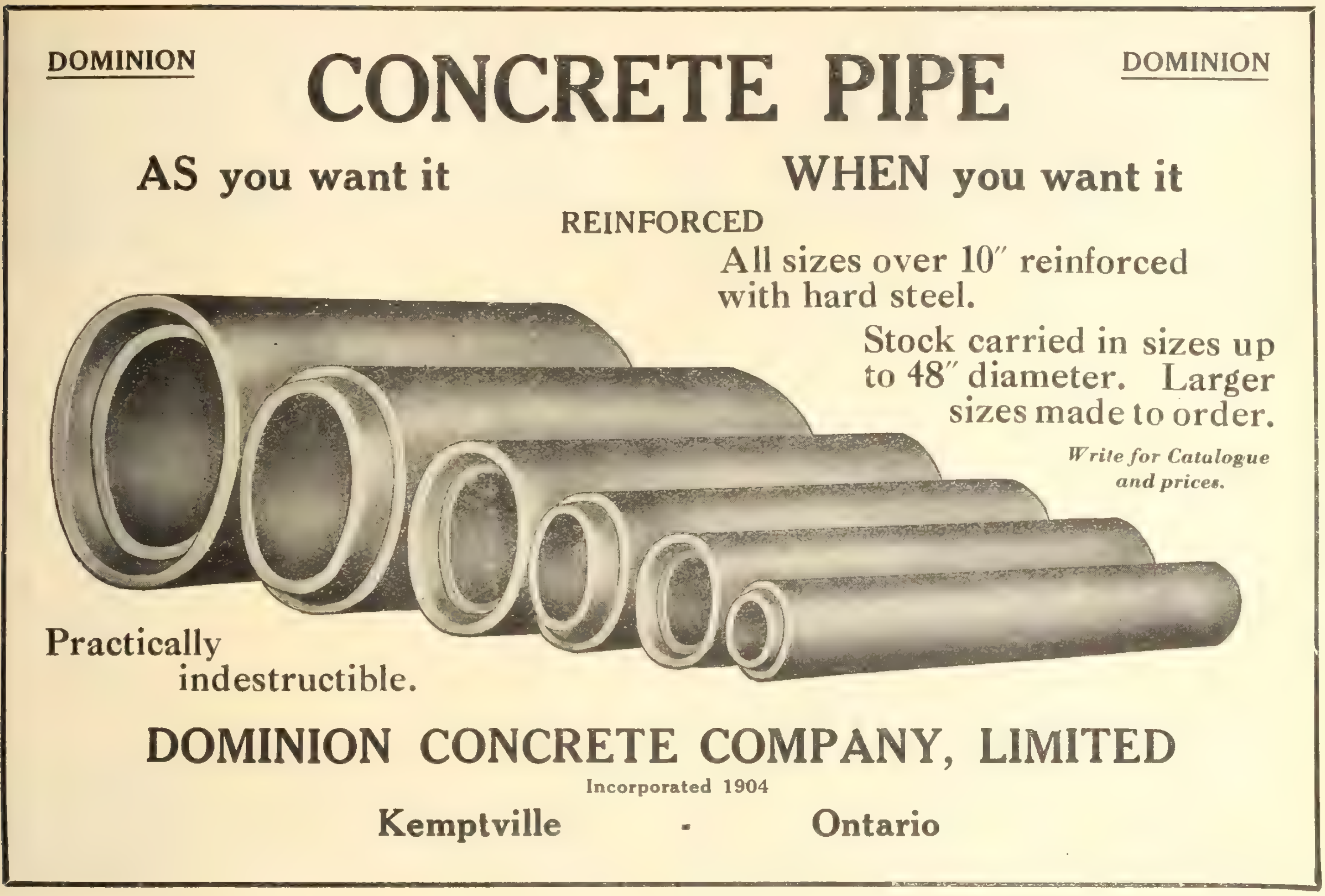

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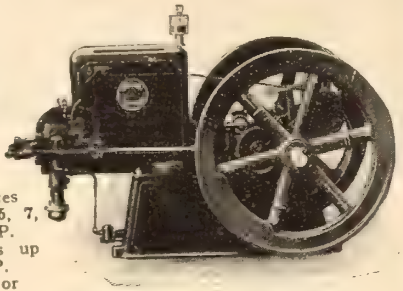

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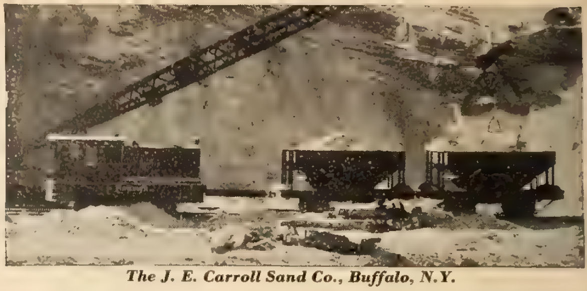

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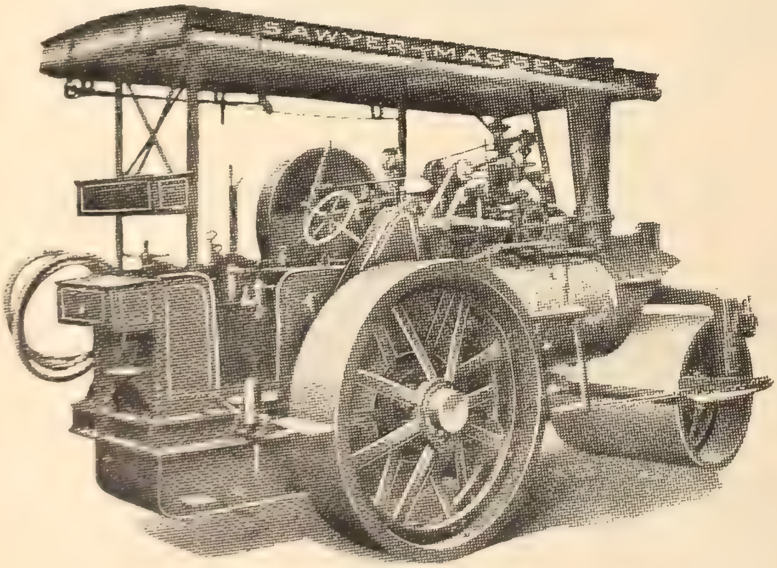

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DEPARTMENT OF LABOUR

BOILER INSPECTION NOTICE

Excerpt from Regulations for the Construction and Inspection of Boilers

Section 300

No Boiler which has been in use for two or more seasons shall be sold or exchanged for subsequent use as a Boiler unless it is accompanied by an inspection certificate issued by the Department within one year preceding the date of such sale or exchange. The allowable working pressure for such Boiler shall be determined by the Inspector from the formulæ contained in the regulations, with such deductions in pressure for depreciation as the Inspector's judgment shall dictate.

The travelling expenses in connection with the inspection of Boilers sold, exchanged or extensively repaired, must be paid by the owner or purchaser of such Boilers, together with the inspection fee of five dollars.

All communications should be addressed to the Steam Boiler Branch, Department of Labour, Spadina Crescent.

HON. W. R. ROLLO,
Minister of Labour.

D. M. MEDCALF, Chief Inspector of Steam Boilers.

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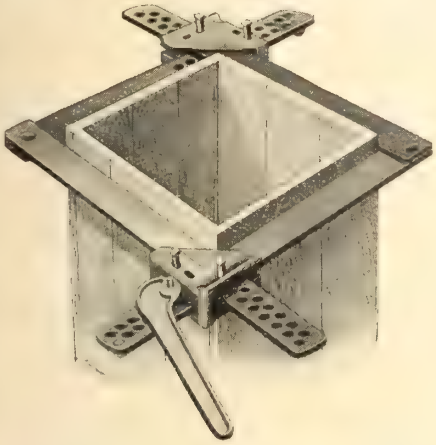

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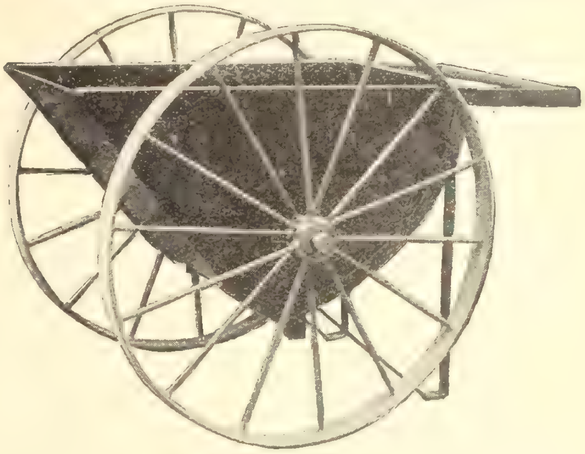

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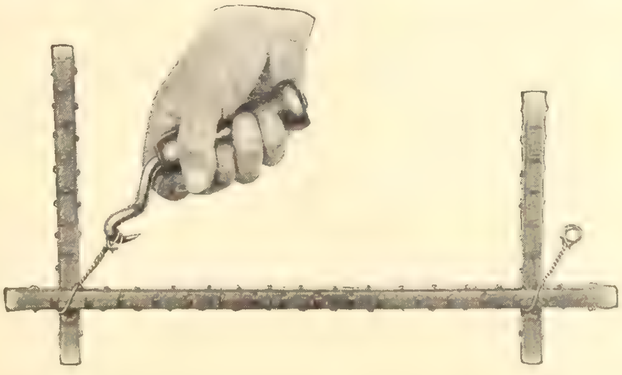

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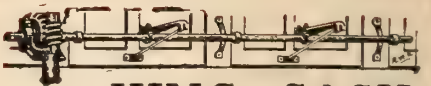

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CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.45
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	10.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	25.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*†	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	25.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M.	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00**	20.00
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Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base	4.00 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.00 "	5.10 base	
Hoops	per 100 lbs.	5.00 "	3.75 "		
Twisted and deformed bars	per 100 lbs.	3.90 "	4.00 "	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	4.00 "	4.00 "	5.35	6.00
Structural shapes	per 100 lbs.	3.90 "	4.25 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.15	6.25
Plates—3/16 in.	per 100 lbs.	4.40 "	4.25 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.50 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.50 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
Cast iron pipe	per ton	65.00 "	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.45	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.80.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.

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CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS—continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	94.50	65.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	45.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	135.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	145.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.50	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	70.00

PAINTS, OILS, COLOURS (delivered):—		Toronto	Montreal	Winnipeg	Vancouver
White lead ground in oil, less than ton lots	per cwt.	15.00	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	14.50
Putty in bulk	per cwt.	5.95	4.25	5.50	6.50
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.43	1.40	1.26	1.56
Raw linseed oil, in bbls.	per gal.	1.40	1.38	1.23	1.53
Turpentine, in bbls.	per gal.	1.75	2.20	2.50	2.80
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45

PLASTER (Delivered):—		Toronto	Montreal	Winnipeg	Vancouver
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	26.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50

LABOR:—		Toronto	Montreal	Winnipeg	Vancouver
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.25	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers (Common)	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Laborers (Skilled)	per hr.	.60- 70			.90
Sheet Metal Workers	per hr.	.80			

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

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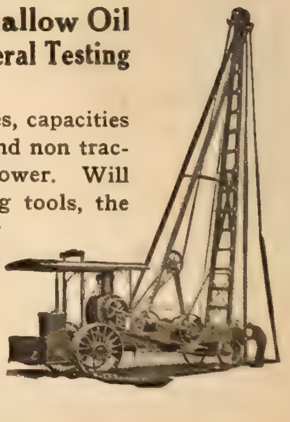

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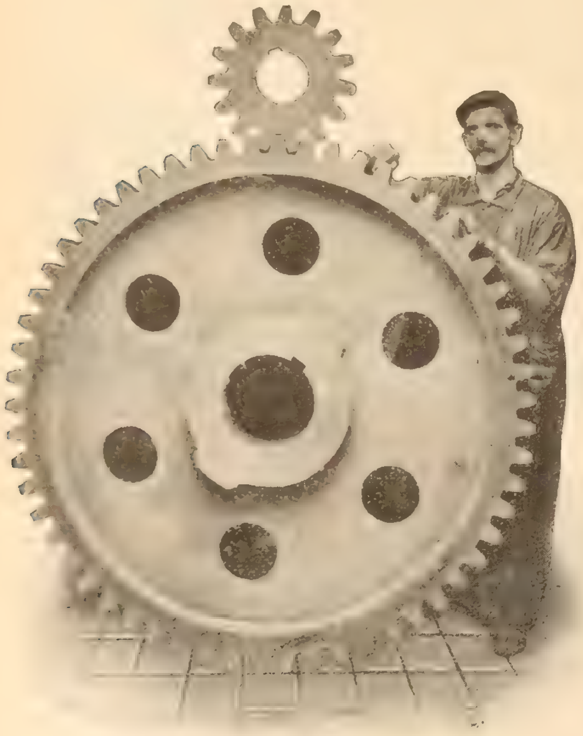

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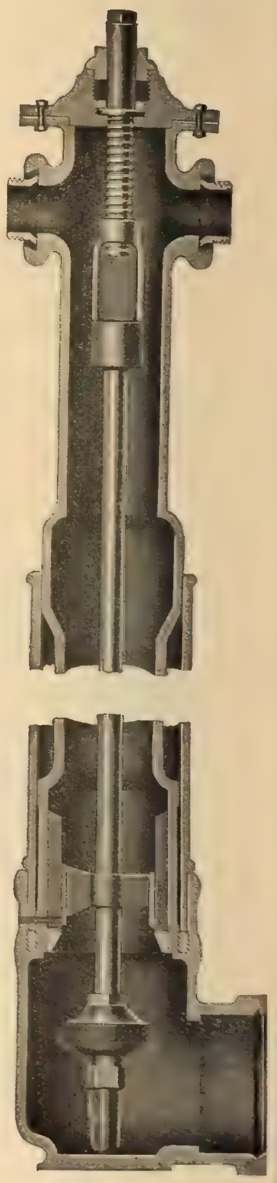

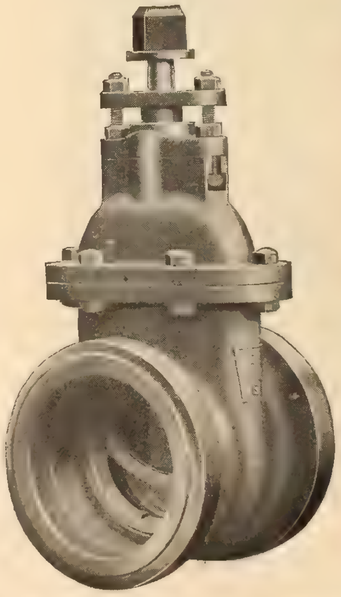

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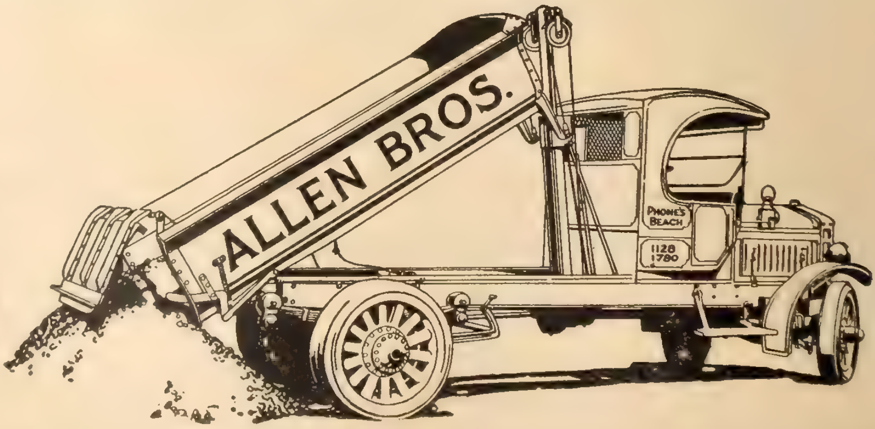

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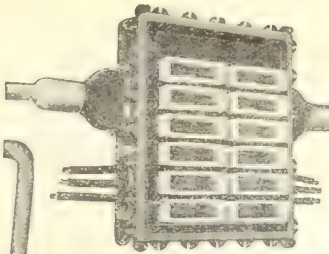

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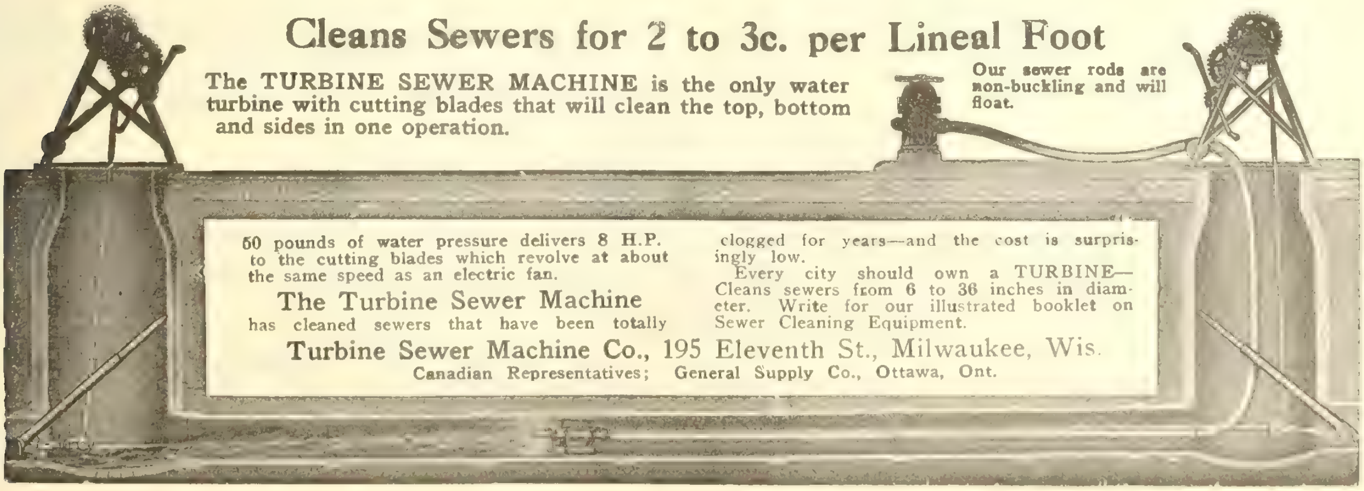

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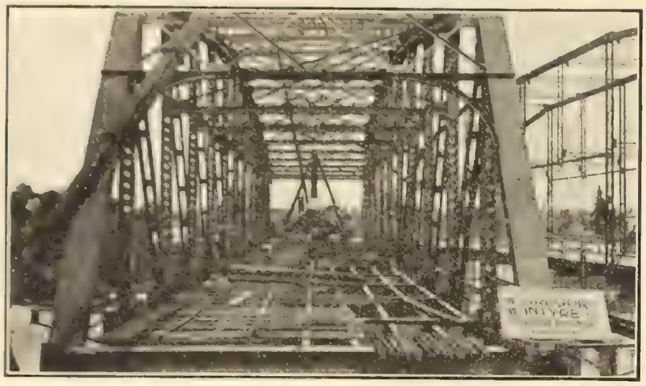

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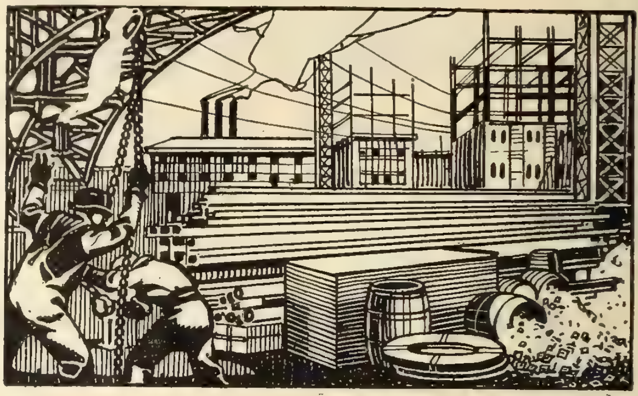

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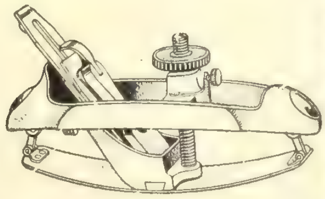

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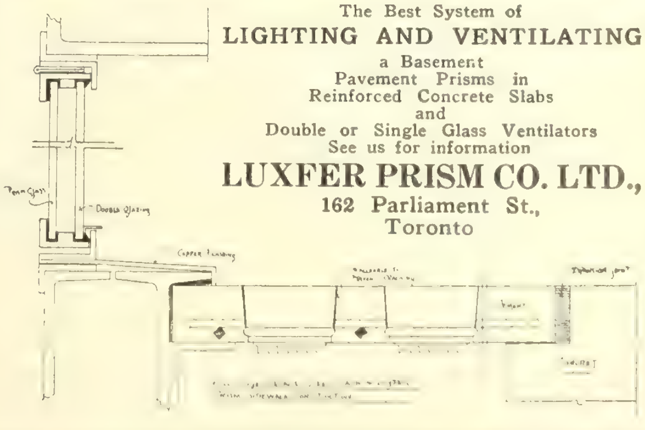

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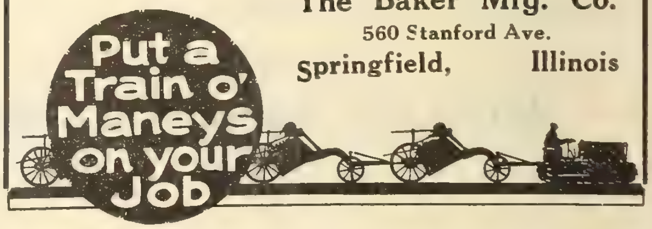
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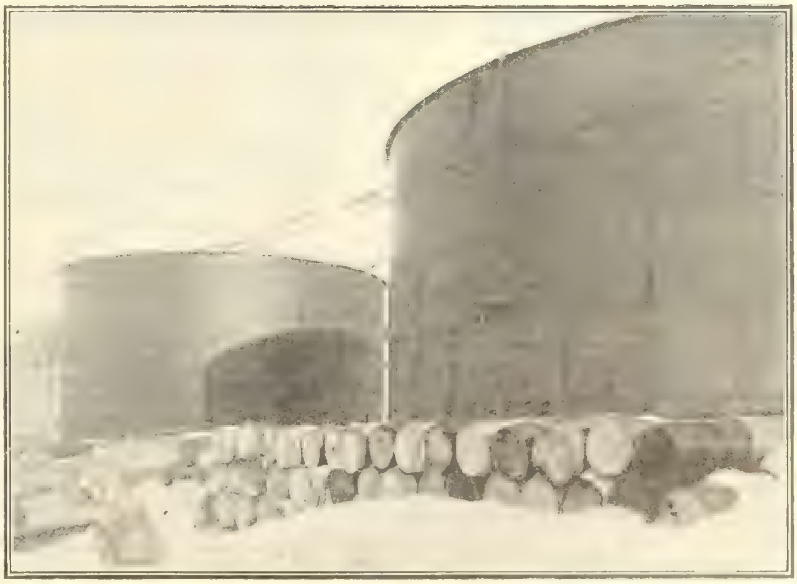

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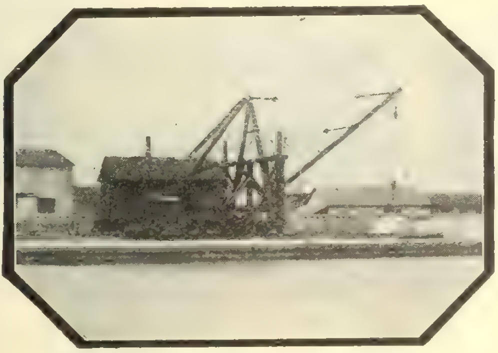

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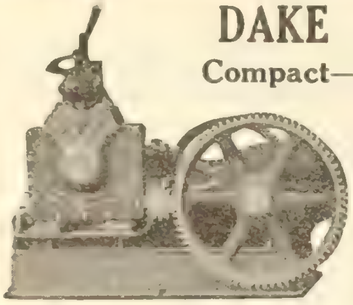

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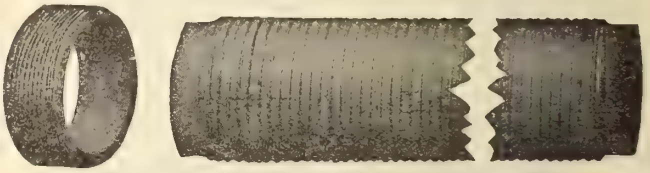

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Vol. 37 Toronto, June 20, 1923 No 25

Contract Record and Engineering Review

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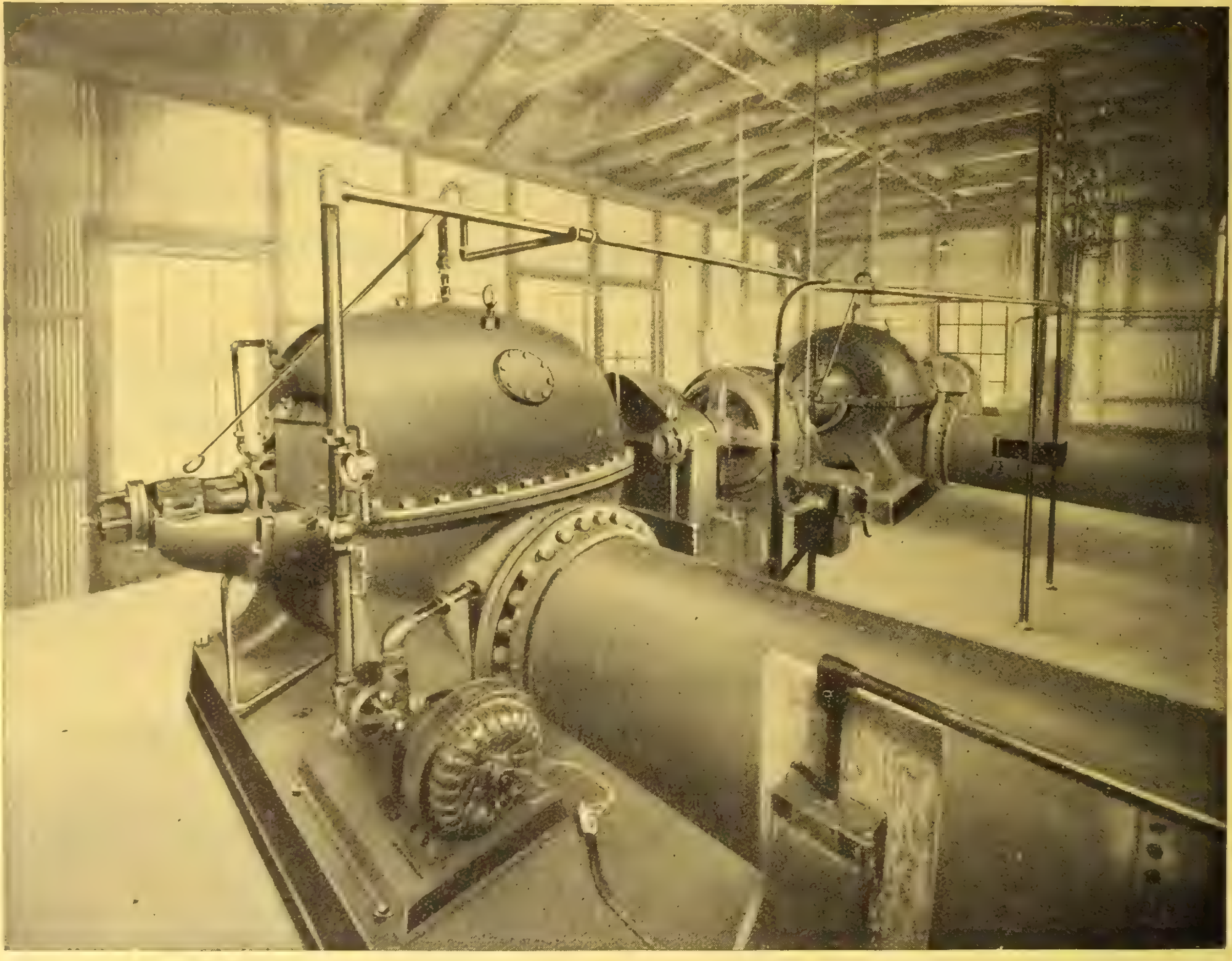

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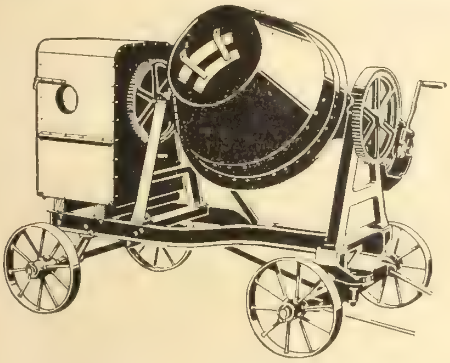

Fig. 814
London Gem Concrete Mixers Nos. 3 and 5

Fig. 814 illustrates London Gem Concrete Mixers, Nos. 3 and 5. Suitable for foundations and other small contract work requiring from 25 to 50 cu. yards per day. Described in Bulletin A-3.

Fig. 33 illustrates London Heavy Duty Builders' Mixers with Gasoline Engine. Made in five sizes, 50 to 300 cu. yards per day. Described in Bulletin 49 D 2.

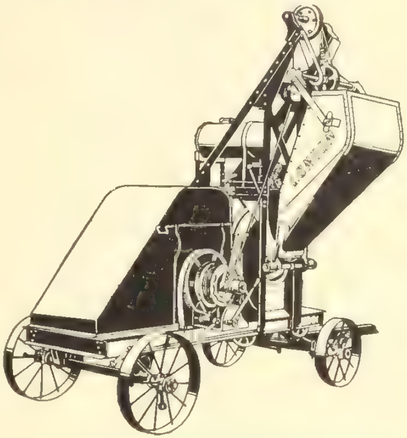

Fig. 33
London Heavy Duty Mtxers with Gasoline Engine

Fig. 39 illustrates London Heavy Duty Builders' Mixers with Steam Engine and Boiler. Made in five sizes, 50, to 300 cu. yards per day. Described in Bulletin 49 D 2.

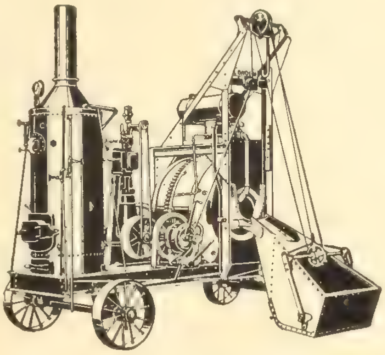

Fig. 39
London Heavy Duty Mixers with Steam Engine and Boiler

Fig. 90 illustrates the London Paving Mixer No. 16 B with Boom and Bucket, Steam Driven. This machine is also made with full caterpillar drive. Described in Bulletin 49 K B.

Fig. 25 illustrates the London Combination Mixers, Nos 4 and 6. A Concrete Mixer with a real Builders' Hoisting Drum attached. Two machines in one. Largely used for excavating and for contracting work requiring up to 60 cu. yards per day. Described in Bulletin 49 D 1.

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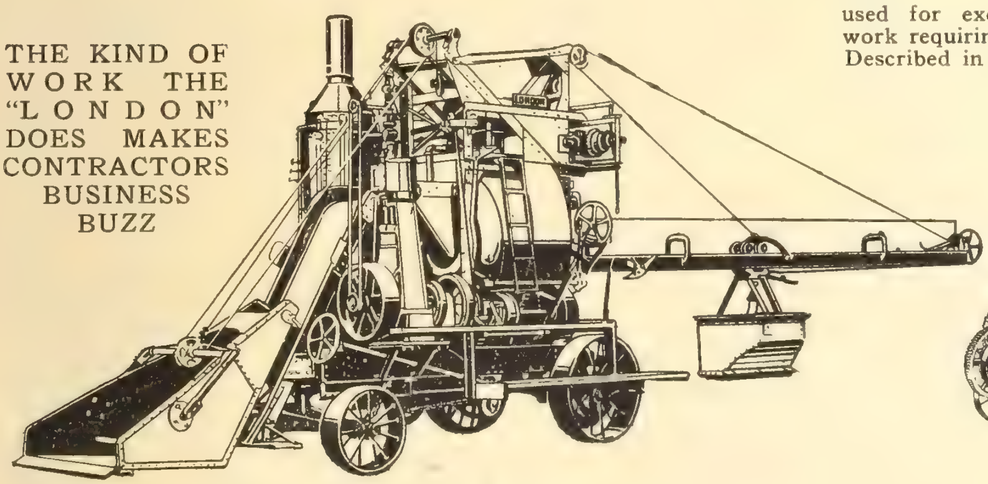

Fig. 90
London Paving Mixer No. 16B with Boom and Bucket

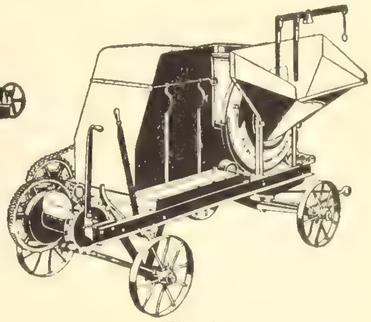

Fig. 25
London Combination Mixers Nos. 4 and 6

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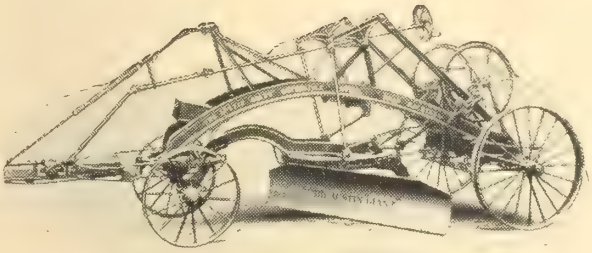

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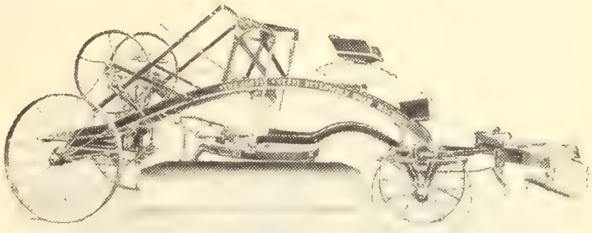

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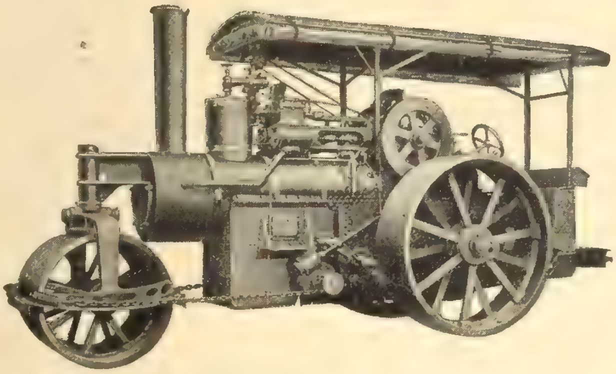

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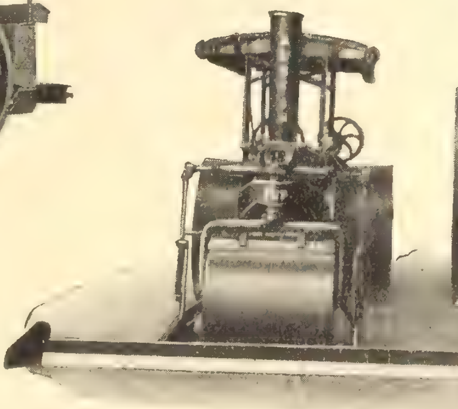

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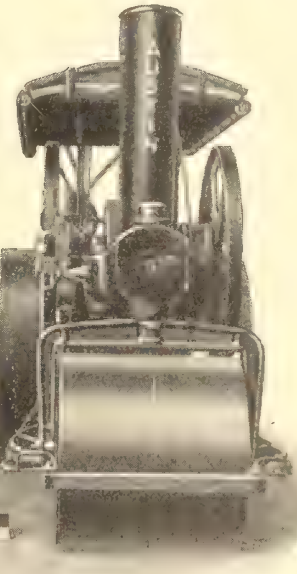

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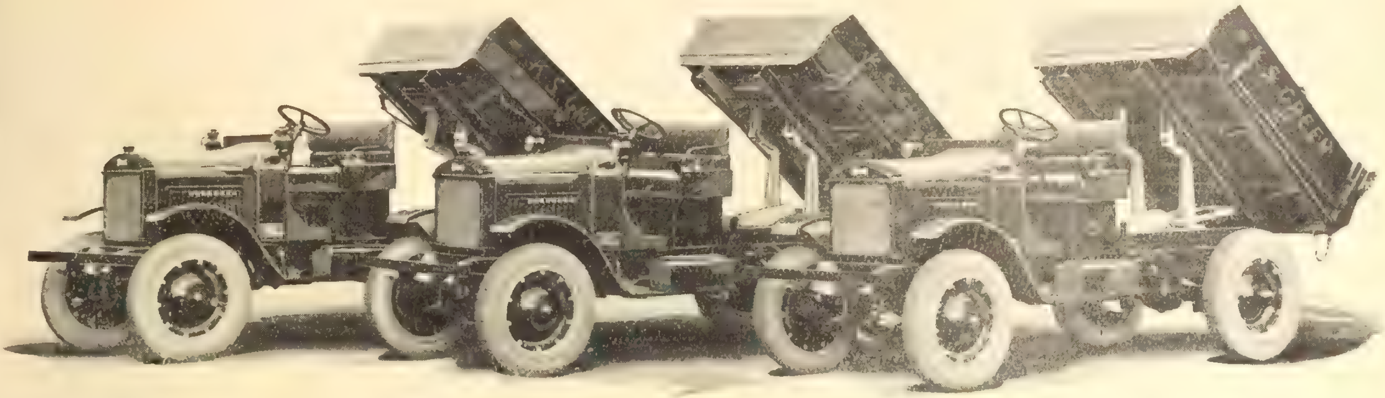

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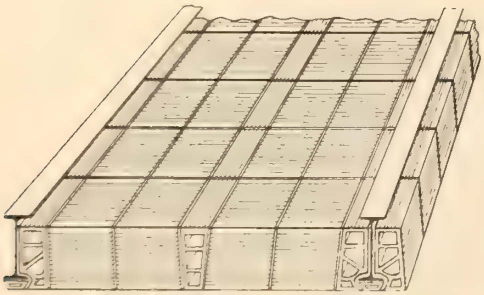

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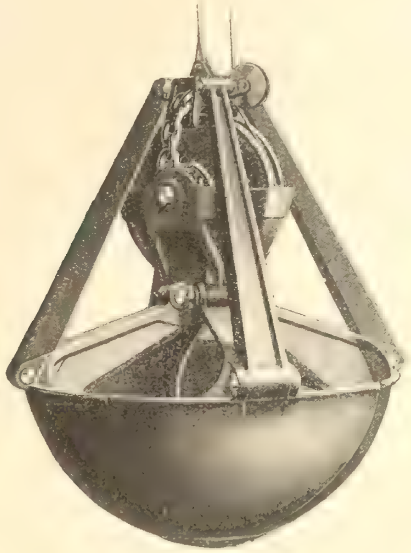

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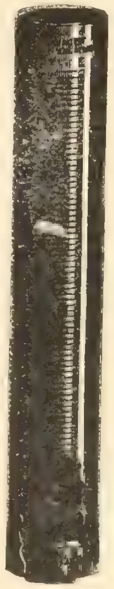

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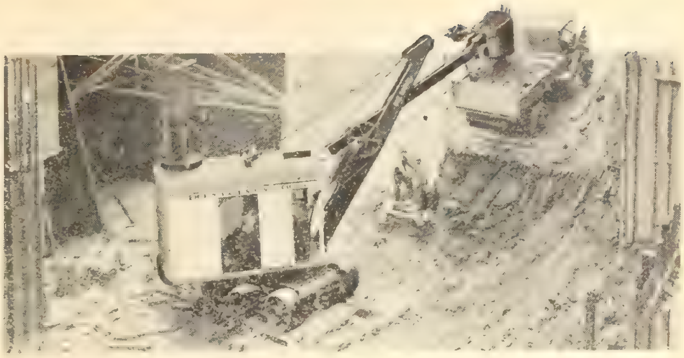

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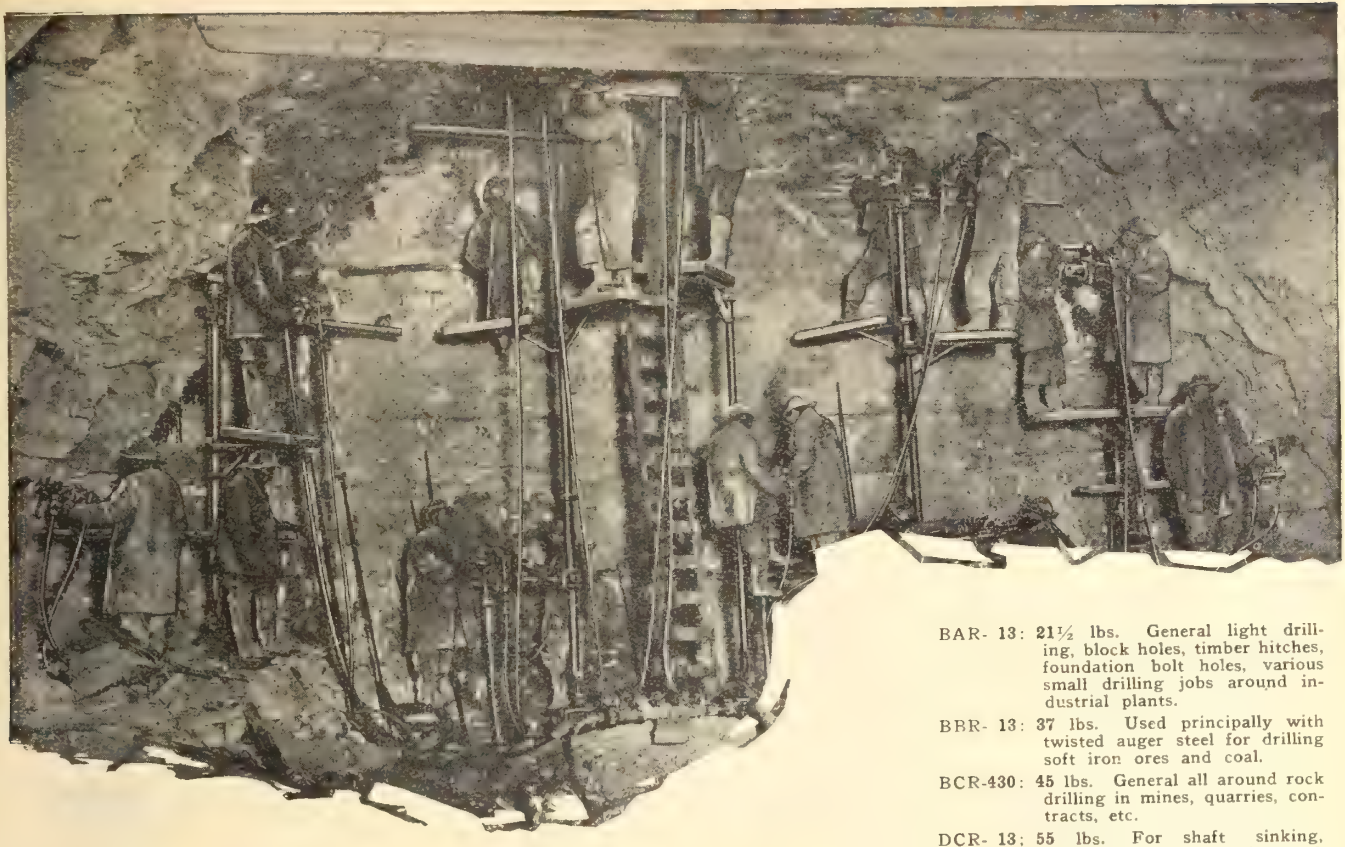

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The truth of this often repeated phase is exemplified by the above photograph which shows a top heading in a 36-ft. tunnel being driven for the Niagara Falls Power Company. This tunnel will be 4500 feet long when completed.

Such work is usually done by "drifters," but the contractors found that the light weight and extreme ruggedness of these small machines, combined with the fact that they may instantly be removed from their cradles and held by hand for drilling the benches, made the "Jackhamer" drills ideal for this work.

This work is being done by the Read-Coddington Engineering Company. All Ingersoll-Rand drills, sharpeners and air compressors are being used on this large project.

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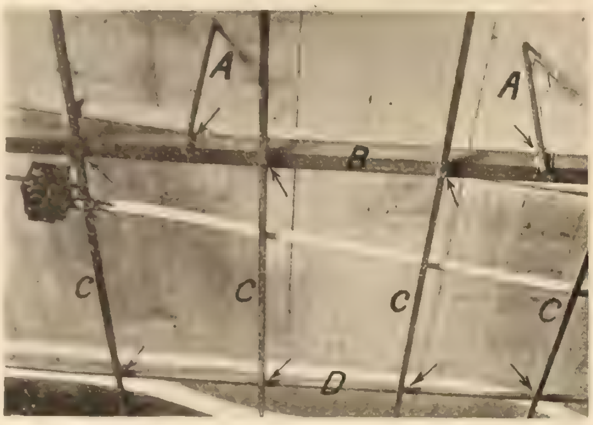

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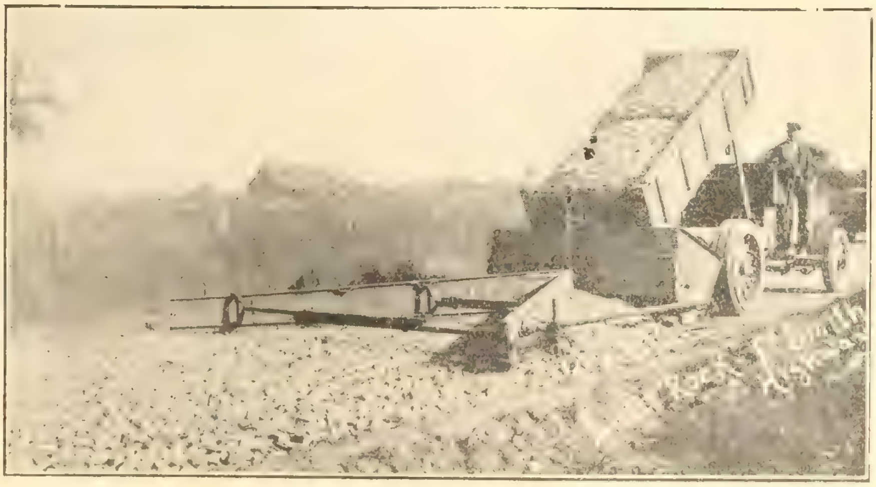

Burch Spreader with wings

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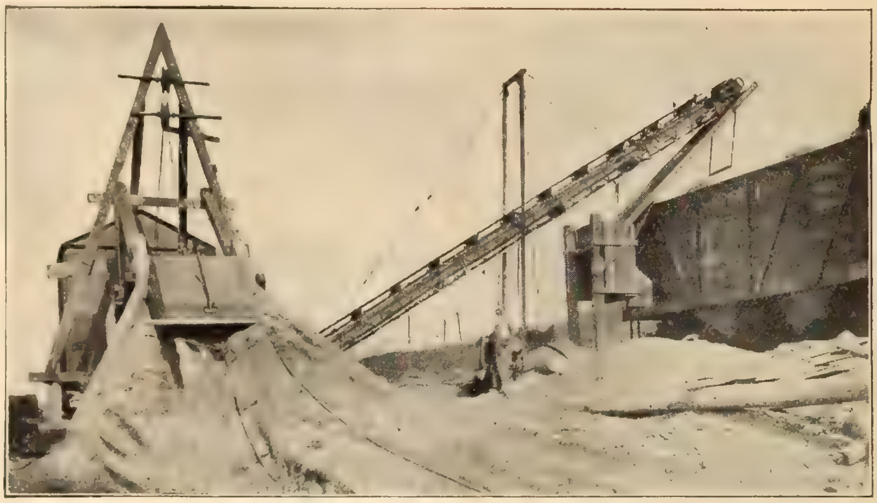

Barber-Greene 60 Foot Conveyor used for loading sand from a beach plant. Send for Gould cost report "N"—on its performance

Reaching 30 Feet Farther Than a Crane

The R. C. Products Trust of Cleveland found that a locomotive crane used to load sand into railroad cars from a Lake Erie beach was decidedly unprofitable.

Its reach was too short. The beach was 90 feet wide between the shore and the railroad embankment. The crane got the sand and gravel within 20 feet of the embankment, but that was as far as it could go.

It was finally replaced with a 60 foot Barber-Greene conveyor, having a reach fully 30 feet longer than that of the crane. This conveyor has now been in use for two years and has shown decidedly satisfactory earnings as compared with the crane.

One day last summer a tornado picked it up, carried it twenty feet, and dropped it upside down without doing any material damage. It is outdoors in the snow all winter, and several times storms have half buried it with sand.

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Our Gould cost report "N", sent on request, gives definite and detailed cost data on the operation of this conveyor.

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MATERIAL HANDLING
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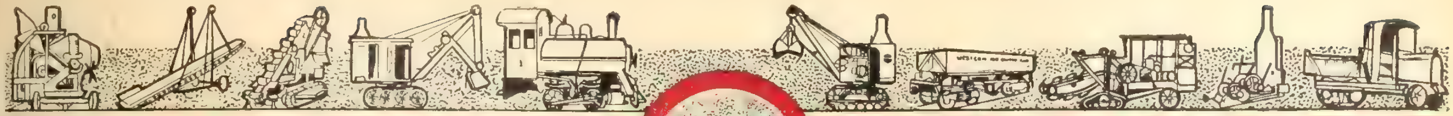

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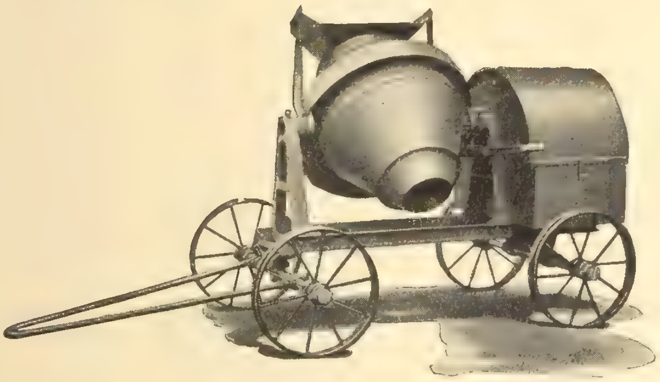

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SMITH MIXERS FAMOUS

Smith 375 Mixer

You can have it with four wheels shown above or with two rubber tired wheels and extension pole for hauling behind your automobile. Wheels are fitted with Clincher Rims for Ford 30 x 3½ Pneumatic Tires.

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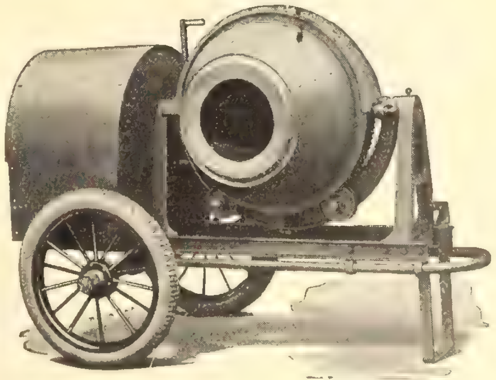

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and Gate Valves

"McAvity's" Hydrants and Valves have been the choice of engineers and municipal officials for nearly one hundred years. Today they are in service in every province in Canada and their numbers increase steadily.

Only products of exceptional merit could boast such a record.

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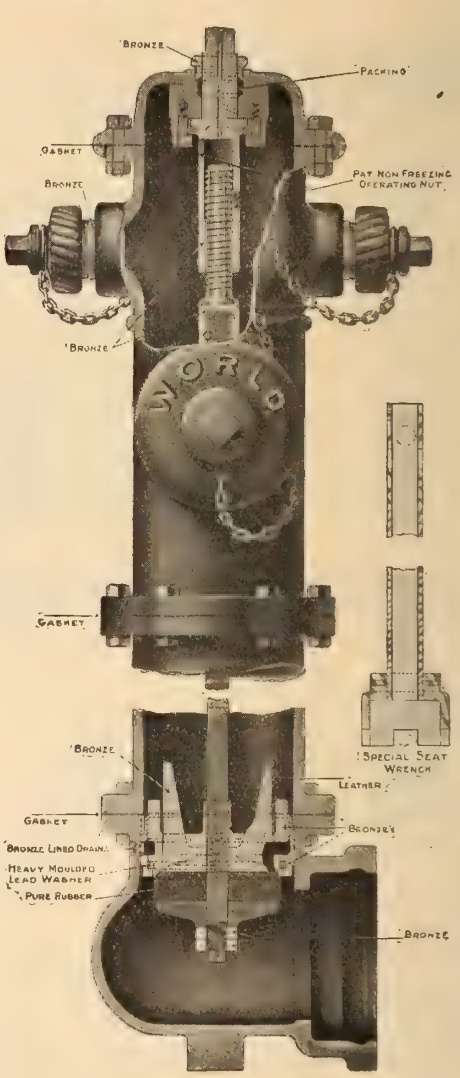

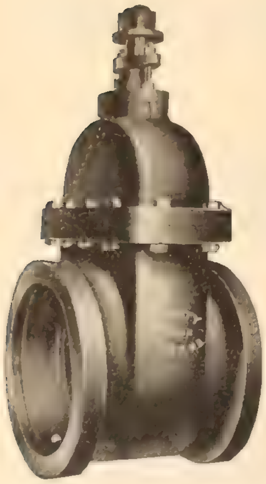

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Photo taken at stop 36, looking south

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Good for 95 per cent—

Keystone Excavator at work on Montreal Aqueduct, removing from **300** to **400** cubic yards per day. Same machine, using Ditcher Scoop instead of Skimmer Scoop shown above, makes a splendid back filler.

There are so few excavating jobs that the Keystone Excavator cannot handle that they are really a negligible factor. Moreover, its cost is about half that of the heavy steam shovel; its weight and build permit it to go anywhere a dump wagon can travel; its different scoops fit it for either road grading, ditch digging, foundation excavating and material moving. It thus possesses flexibility and advantages which no other machine can touch.

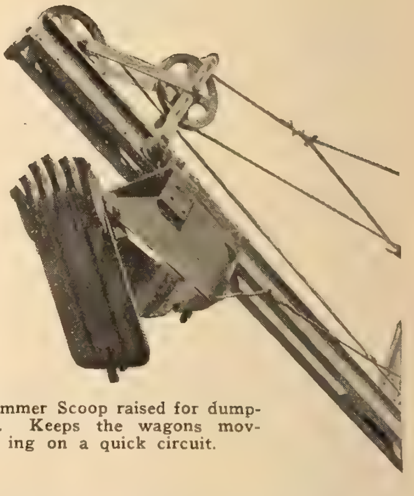
KEYSTONE EXCAVATOR

Model 4'23

The new 5/8 yard Skimmer Scoop

Here is a heavier design Scoop that will enable the Keystone to do even better work at road grading and all shallow excavation. The Scoop travels on the boom on six rollers instead of four—giving better load distribution and smoother, quicker work. The front housing of the Scoop has been flattened, giving greater clearance for the material as it enters the Scoop. Teeth of new design and heavier construction have been included. The new Skimmer Scoop gives increased output. The Keystone's 32 h.p. engine gives it ample "punch". Present Keystone operators can use it as there is no change in the boom.

Accurate spotting of Dump Wagons with the Keystone over a radius of **28** feet



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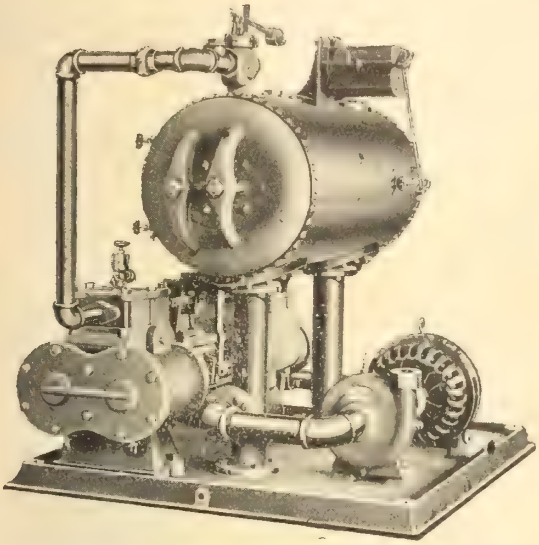

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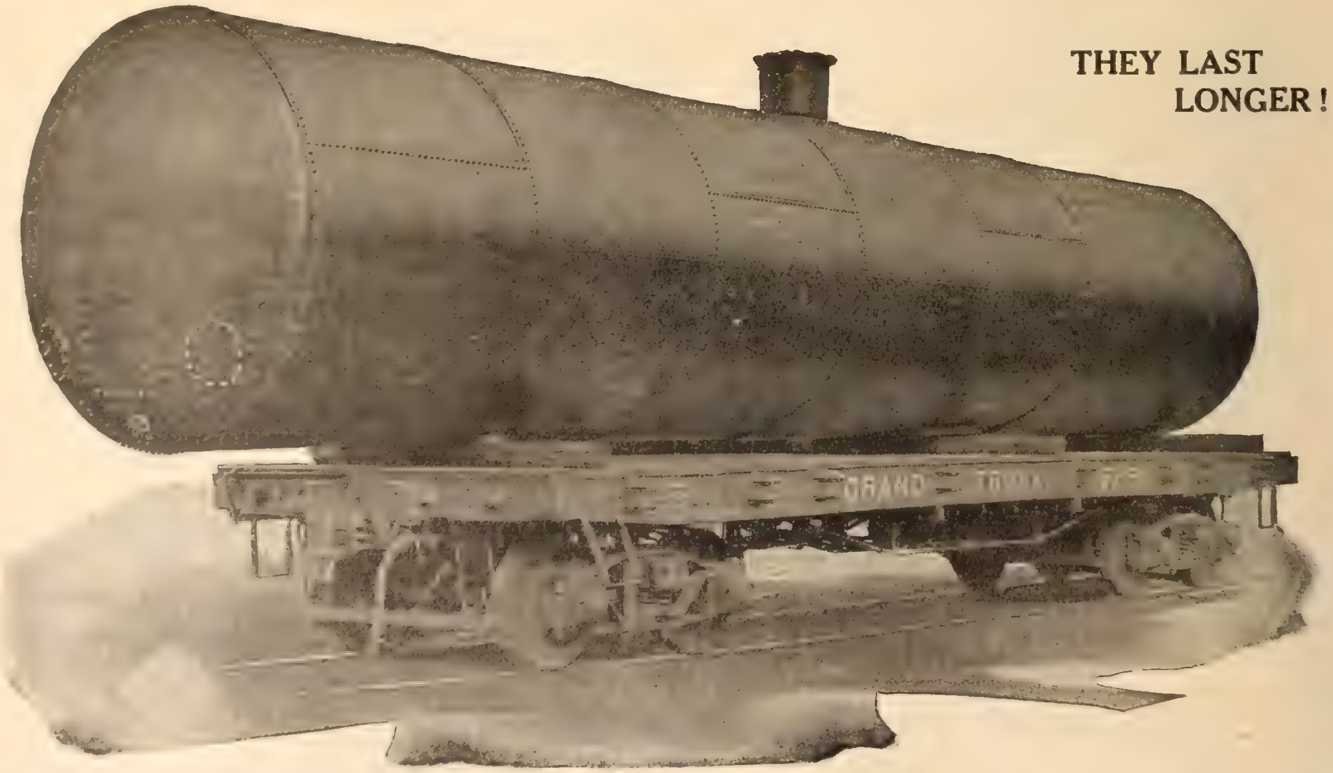

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There is Still Work for the Canadian Good Roads Association to Do

Once again the Canadian Good Roads Association has met in annual convention. For ten successive years it has carried on its work with results that are worthy of the strongest approbation. During this time, as an organization of good road enthusiasts, it has sponsored the movement for improved highways from coast to coast with an ardor that has refused to be dampened by either the indifference of people and governments or the enormity of the task of providing well built transportation routes in every province of the Dominion. Persistent efforts have borne fruit, however, and today the Canadian Good Roads Association can boast that it has accomplished at least the first object of its activities, the education of the public mind to a realization of the importance of good highways in relation to the economic development of this country. Every province in the Dominion is now participating in a highway building programme, the like of which has never been experienced before. and it may be said without prejudice that for this the Canadian Good Roads Association can claim no little credit.

There is still more to do, however. This fact was stressed several times by various speakers at the recent convention and particularly by Hon. Mr. Perron, minister of roads of Quebec province and retiring president of the association. The very fact that the highway movement has become so widespread has brought up new problems which demand solution. Thus, the question of how the roads should be paid for is one that is uppermost at this time, and associated with this is the matter of federal aid, for the extension of which the association has undertaken to continue its fight. Then, perhaps most important of all, is the necessity for protecting the vast capital investment that has been made for roads. This demands urgent attention, for, from present indications, the roads recently built will be of only scrap value in a few years' time unless means are taken to protect them and thus protect the investment that the people have made. These are only a few of the problems that are developing but they indicate at least the necessity for continued activity on the part of the Canadian Good Roads Association.

Bridge Design Practice is Undergoing Constant Development

No more thoughtful or carefully prepared review of any one phase of construction has appeared in the Contract Record than the article on development in bridge practice which appeared in the annual number issued on May 30. Its author, Professor C. R. Young, of the University of Toronto, is well qualified, both by his theoretical and practical knowledge of bridge design and also by his close contact with what is going on in the world of structural design, to give to his comments on this subject a note of authority and perhaps of prophecy.

In his review of bridge practice, Prof. Young has sensed certain trends that bespeak a positive development of the art in the future. He states: "The art of bridge construction is still in the progressive stage. . . It is very probable that we shall see remarkable developments in bridge design and in related construction practice within the next generation." What these improvements are likely to be, Prof. Young proceeds to forecast, first outlining the factors that are influencing bridge design. New or improved materials bring about important changes in design and construction practice, as do also improvements in shop and field erection equipment. The constantly changing load requirements affect the designer's ideas, while, as analytical and experimental data accumulates, modifications or innovations make their appearance. Thus it is that the use of alloy steels has grown in recent years and that stress allowances are beginning to go beyond the rather empirical limits that have governed design practice in the past. These and other tendencies, so noticeable in these present days and of such important influence on the future development of the bridge building art, are summarized by Prof. Young in these words, "There is a desire to make every pound of metal work."

So far as concrete bridges are concerned, there is in Prof. Young's opinion a tendency toward refinement of detail and perfection of thoroughly established types, with truss bridges giving way to arches, in connection with which "surprising developments may be expected in the span."

Obviously, in the scope of this brief editorial it is impossible to adequately refer to all of the points brought out in the article under construction. One matter, however, is worth a special word of emphasis and that is the indifferent care that has been bestowed on the design of many bridge structures. "There has been too much of the slap dash in the preparation of designs," states Prof. Young, and one can readily believe it after seeing some of the structures that are common on our highways or observing the loose practices in vogue in some draughting offices. Large factors of safety cover up the lack of proper design knowledge and add unnecessarily to the cost. The client, in such a case, is the loser, for he is paying more than he would justifiably be called upon to pay, were designs more perfect. For such as have tolerated sloppy practice in this regard, the motto "Make every pound of metal work" may be offered as a thoroughly satisfactory working guide.

Canada Needs Trained Road Builders

The Teaching of Highway Engineers Has Become a Matter Meriting Serious Consideration in View of the Large Expenditures for Road Construction—How Should Specialized Training be Given

By R. deL. FRENCH
Professor of Highway Engineering, McGill University, Montreal

Submitted at the convention of the Canadian Good Roads Association

That Canada needs good roads admits of no argument today. We see the effects of the lack of them on every hand, and we feel those effects in that most sensitive point, our pocket book, whether we realize it or not. In the last ten years, we have accomplished a good deal toward providing ourselves with an adequate system of main highways, but we have still far to go before our wants in that direction are even moderately well satisfied.

Efficient and economical roads require efficient and economical planning, construction and administration. Up to the end of the nineteenth century, progress in highway transport, whether of goods or persons had been slow. Its steady upward trend had been upset from time to time by various influences, canal construction, the development of the steamship and the mushroom growth of railways, for example. Accordingly, progress in the art of road building had been equally slow. It is true that men of the type of McAdam and Telford had given of their best, for which we honor them today, but man still travelled by highway on his own legs or through the agency of those of some animal. There was little or no demand for good roads as we understand the term today.

The advent of the motor vehicle has changed all this. Greeted with jeers, there is probably no single invention of modern times which has so profoundly altered life as has the automobile and its mate, the motor truck. Where the development of motor vehicles will ultimately bring us, no one is rash enough to prophesy. Certain it is, however, that life has been made pleasanter for most, I might say all, of us, because of the altruistic activities of Henry Ford and his kind.

The year 1900 might be said to mark the birth of highway engineering, as we think of it now. Pretty much all that we know, or think that we know, about road building has been learned since that time, and I can assure you that there is a great deal which we do not know as yet. There is probably no branch of the engineering profession so closely related to so many others, so dependent upon economic studies for success, nor so beset by rule-of-thumb methods as highway engineering. The economics of highway engineering is almost a science in itself, but one with which the road builder must be passing familiar, or he is sure to come to grief. Rule-of-thumb methods are the curse of any profession and are like the diseases of childhood, unavoidable and giving way to more scientific ones as the profession attains years of dignity and understanding.

The Importance of Training Highway Engineers

The training of road builders has become a matter meriting the most serious consideration. Increasing traffic demands, new types of traffic and mounting costs have combined to make it necessary that the utmost care shall be exercised to secure a dollar's value for every dollar expended. In the United States, the Highway Education Board has been organized for the purpose of fostering the right type of training. It has estimated, roughly, of course, that at least, 1,000 trained men per year are required there to take care of highway construction and administration as these should be taken care of.

In Canada, we have no need of such a large number, but there is a very real and pressing demand for trained men, nevertheless. I should say that about 100 men could be advantageously absorbed every year by the Federal and Provincial highway authorities, contractors and other interested organizations. In addition, there are many now employed in highway work who would be the better for some supplementary education.

To my mind, there are three classes of men who must be considered in discussing any programme of highway education. They are:—

1. The foreman, call him what you like, whose knowledge must be largely practical, but who would benefit by a better understanding of the fundamentals underlying his work.

2. The engineer not in highway work, who is, however, pretty sure to come into contact with it in some form sooner or later.

3. The comparatively small class of those who feel a "call" to devote their professional lives to road building.

The training of foremen and other similar subordinates can be and is being quite successfully carried out by means of short courses, sometimes supplemented by laboratory work, and always planned to stimulate the interest of the student to the maximum and bring out as much discussion as possible. Such courses are offered by some of our universities, and have also been conducted by the highway authorities themselves. The results have been so satisfactory that I think we may consider this particular problem settled, except that provision for such training is needed in areas now without it.

Nearly all our universities and colleges giving engineering instructions provide for some undergraduate work in highway engineering and allied subjects. While there is little doubt but that the work along these lines will improve, I consider that, on the whole, it is fairly satisfactory and meets the needs of the general student well. Thus we may justly feel that we have taken care of the interests of the second class of man, or are in a way to do so in the not very distant future.

Training the Specialist

Opinions differ as to the best methods of training along specialized lines. Educators are divided into two camps—those who feel that it can be accomplished in the undergraduate years, and those who think that such training should be reserved for graduate work. I confess that I incline to the latter belief.

A rather careful analysis of the courses in civil engineering given at seven of the leading Canadian universities shows the division of time between "fundamental" and "special" studies during the four years to be about as follows, on the average:—

Year of course	Hours in year	Fundamental subjects,		Special subjects	
		Hours	%	Hours	%
1	875	745	85	130	15
2	875	745	85	130	15
3	875	675	80	200	20
4	875	635	75	240	25
All	3500	2800	80	700	20

For a thorough-going course in highway engineering, we have, therefore, apparently about 700 hours available, or the equivalent of a little less than the average academic year. I say "apparently," as in reality I do not believe that there is this much time which may be used.

No specialization of value can be attempted in the first two years of an undergraduate course, for the reason that at this time the student has not yet acquired enough "fundamental" education to profit by special teaching. Thus, we should deduct 260 hours from our 700, leaving 440 hours in the third and fourth years. Included in the latter figure is the time used for instruction in special subjects which should form part of a real highway engineering course. An examination of the calendars of the universities referred to will show that approximately 50% of this time is so occupied, leaving only 50% free for other purposes. We are cut down, then, to 220 hours in which we must impart a sound knowledge of road design, location, construction, maintenance, finance, economics and administration. This is the equivalent, say, of six lectures of one hour and four drafting room or laboratory periods of three hours each per week for the common twelve-week term.

There may be those who would undertake to give a comprehensive training in this limited time, but I am not among them. There are also, to my mind, other objections to much specialization for undergraduates. As a rule the student is immature, and, I am sorry to say, many are not enough in earnest to profit greatly thereby. There is generally little opportunity for the correlation of class-room and laboratory work with the conditions of actual practice. Much time may be devoted to extra-curriculm activities, which is as it should be, and of which I, for one, am heartily in favor, since I believe that often much of the most value in a collegiate training is obtained through contact with one's fellows and participation in student affairs.

Most of the objections urged against undergraduate specialization do not apply at all, or at most apply with very much diminished force, to graduate work. More stringent admission regulations may be enforced, with the result that the unfit and the lazy may be barred out. Since numbers should be, and are small, it is not necessary to adhere to a definite schedule, hence the "punishment fits the crime," and each man can get instruction adapted to his mental peculiarities, so far as it is possible for his teachers to provide it. The pull of student activities is much lessened when one's former close associates are no longer at hand. Since the class is now replaced by the individual, its restrictions disappear, and with them the feeling, wrong but common, that getting an education is a battle, and the instructor and the class the combatants. In short, a graduate student must stand on his own feet, must show a genuine interest in his work, cannot shirk, and offers far less of a problem to his teachers than the undergraduate.

You may agree with me that the advantage of graduate courses are manifold and obvious; then your question will naturally be," How can we provide the facilities for such work, and how can we induce men to utilize them once they are provided? This is where the rub comes. After four years of expense in a university, the average man cannot be expected to face the prospect of an additional year or two of the same sort of struggle with pleasure. Often, the inclination to continue study is present, but funds to make the continuation possible are absent.

Means of Attracting Highway Engineers

I believe that the provision of an adequate number of properly trained highway "experts" can be assured only by the provision of opportunity for graduate work. Suitable courses should be established in, say, four of our universities, strategically located from the geographical standpoint. The cost of operation should be met by those most interested in getting the proper type of men into highway work—the provinces primarily, with perhaps some assistance from the federal government, producers of road-building materials, contractors and others. I believe that admission to such a course should be restricted, if possible, to men with a year or two of practical experience. To attract such men, the value of the scholarships should range from $500 to $750 per year, exclusive of tuition fees, etc.

Here, it seems to me, is an opportunity for somebody. To those of you who are in the business of spending public money for highways, I need not mention the advantages of having a body of trained men to choose from: to those of you who are trying to make some money for yourselves or your stockholders out of the "road game," I would add the lure of possible research in helping to solve some of your problems.

Boosters of Better Highways from Coast to Coast Gather at Hamilton, Ontario

Canadian Good Roads Association

Holds its Tenth Annual Convention on June 11-14—Papers and Discussions on a Wide Range of Topics Were Presented—Maintenance Regarded as the Most Serious Problem at Present

Representatives of every province of the Dominion of Canada, with the exception of Prince Edward Island, were present at the tenth annual convention of the Good Roads Associatoin, which was held in Hamilton, Ontario, on June 11-14. With a total registration approximating 300, the interest in the proceedings was keen and the discussions profitable. Several speakers stressed the fact that while the association has already accomplished most of what it was organized for, namely, the promotion of good roads throughout Canada, there was still a great work to be done that demanded just as vigorous a propaganda as the association had ever carried through. Throughout the various sessions evidences of this were observed and it is safe to say that the association will continue in the future as it has in the past to work for the betterment of the Dominion's highway transportation facilities and the cementing of provincial and national ties by the construction of improved highways. It was the consensus of opinion that the 1923 meeting, which was the tenth in the history of the association, was successful from every viewpoint, not alone in the direct information which was broadcasted regarding good road policies and methods but also in the spirit of co-operation and interprovincial friendliness that was established.

The meeting opened on the morning of Monday, June 11, with the president, Hon. J. L. Perron, minister of roads, province of Quebec, in the chair. In his address he briefly sketched the progress of the association's activities and submitted an outline of what there still remained for accomplishment. He referred in particular to the necessity for further federal assistance and intimated that the association would still continue to work for the further co-operation of the Dominion government in connection with highway construction.

An official character was given to the opening by the presence of Hon. H. Cockshutt, lieutenant-governor of Ontario, who in opening the convention referred to the remarkable development which has taken place in connection with highway construction. He attributed a great deal of the present popularity of the good roads movement to the increase in the use of motor vehicles.

The welcome of the city of Hamilton was given by Mayor Jutten who outlined a few of Hamilton's outstanding characteristics and advantages. Various public officials also addressed the meeting including Hon. E. H. Armstrong, premier of Nova Scotia, Hon. F. C. Biggs, minister of public works and highways of Ontario, A. W. Campbell, chief commissioner of highways of Canada, J. D. McLean, chief engineer of highways, New Brunswick, and A. McGillivray, chairman of the Manitoba Good Roads Board. Their addresses all stressed the importance of developing transportation routes and emphasized the national character of the highway problem. Thus Premier Armstrong stated: "The highway problem in many aspects is a national one and there is nothing which cements the feelings of the people such as highways that touch the rank and file, that keep people satisfied and bring home contentment. We should build up irrespective of provincial lines the idea of developing good highways."

S. L. Squire, chairman of the executive of the association, replied suitably to the welcomes. "This association views with alarm the increasing loss of life on highways and while we do not wish it understood that the motorists are being blamed, abuse of the highway by its users is the chief reason. I think lights should be carried by all vehicles, at least at that season of the year when traffic is heavy. The educational campaign should be continued, and the profitable use of the roads encouraged.

In the afternoon the delegates were given through the courtesy of Hon. F. C. Biggs, minister of highways of Ontario, an opportunity of inspecting newly constructed provincial highways in the vicinity of Hamilton. An automobile tour was arranged through Guelph, Kitchener, Preston, Galt and Dundas—one of the finest portions of the province of Ontario from an agricultural and scenic viewpoint—various types of pavement in different stages of construction were encountered. The whole trip served to impress the members of the association with the vastness of the highway development that the Ontario government has undertaken to carry through.

* * *

Maintenance is the Big Problem

President Hon. J. L. Perron opened the second day's meeting by stressing the necessity of road improvement. He was certain that nowhere in Canada was there any doubt in the minds of the people about the benefit of good roads. Rather was the problem now that of getting money for highway programs.

The duty of those in office was, first, to plan a good roads system, connecting each province with the other parts of the country, he declared. The next problem was that of financing. Then it must be decided what type of road was best suited to conditions.

After the roads were built, another problem began, that of maintenance. The provinces had built miles of roads at great expense, yet these roads built a few years before, are now being used up. This subject was the problem of the day, and thus the association showed particular interest in it. Something had to be done to make sure that the capital invested might not be lost.

Another problem, according to Mr. Perron, was how the traffic should be regulated. On one side was the motor traffic. People were paying a license for the use of vehicles, and they were perhaps rightly of the opinion that they should use the roads as they pleased, while those who made the construction of roads possible looked on with grave concern. The question of regulation of traffic, closely allied to that of maintenance, was one causing trouble all over the world. No government could pay out millions for its highways and then allow the traffic to wear out the roads in a few years.

The speaker was not taking the view that the drivers of motor-vehicles had no rights on the roads, but at the same time, those rights had to be viewed together with those of the farmers and the others who were paying for the roads. No matter what the cost of the license for the motor may be, it was but a fraction of the damage the vehicle did to the highway.

"The question now," Mr. Perron concluded, "is not one of building roads, but of keeping those we have. If we, as an association, do not call the attention of the people to this fact, in a few years the roads costing so much will be worse than before."

Test Road Experiments

"Test Road Experiments" was the subject of an enlightening address by J. A. Duchastel de Montrouge, manager and engineer of Outremont, P.Q. "Many states," Mr. Duchastel stated "have seen fit to establish bureaus of roads, for the purpose of research and improvement, dealing with such questions as surfacing."

The paper, which was quite exhaustive in its treatment of the subject, detailed tests carried out by the Bureau of Public Roads, Washington, D.C., relating to surface wear, drainage, sub-soil moisture, load effects, impact and other elements of vital concern to road designers. Lantern illustrations helped to explain some of the tests and the instruments used for carrying them out.

R. R. Benedict, assistant state highway engineer of Illinois, discussed the matter brought up by Mr. Duchastel. He described the Bates test road constructed to determine what pavement was the best for the expenditure of the money alloted to the state. He said that the test road costing $250,000, had saved the state $4,000,000, by cheapening construction.

Research on the test road had revealed that summer heat, rather than frost, affected the concrete roads. The contention that the corner of any paved road was the weakest part, was well borne out by the experiments. The conclusion was developed that a pavement thicker on the outside edge was strongest.

The real conclusion drawn, the speaker said, was that unless traffic was regulated, any economically-built road would seriously suffer. The few who would not conform to any reasonable regulation did more harm than all the others put together. Pavements would stand up as long as the legislature enforced maximum load laws.

* * *

How Roads Should be Paid for

In the afternoon Hon. E. H. Armstrong, premier of the Province of Nova Scotia, led off with a paper entitled "Who Should Pay for the Road?" This paper is reprinted in its entirety elsewhere in this issue. After its presentation Mr. Armstrong made some references to federal aid stating that it should be continued because the policy to assist the province was sound. While certain critics had advanced the argument that the provision of federal aid was in contradiction of provincial rights he felt that the provinces need feel no alarm as far as their status and rights were concerned. The debates in the Dominion House of Commons had indicated that good results were considered a national problem and he thought that it could be asserted definitely that the responsibility for the construction of highways was not purely a local matter. "Don't let us have too parochial or too provincial an outlook," he said. "Do not fear that in giving aid to the provinces the federal government has trespassed on provincial rights." Mr. Armstrong outlined the movement which led to

The Retiring and Incoming Chief Executives

Hon. J. L. Perron, 1922-3 president

Russell T. Kelly, 1923-4 president

the giving of federal aid stating that it grew out of the provinces demand for a portion of the vast revenue which the Dominion government was receiving from customs and excise duties. Ten per cent. of these duties was mentioned as being a fair allotment to the province and good roads was certainly in need of encouragement from a fund of this kind.

Training of Highway Engineers

"The Need for Specially Trained Highway Builders" was the subject developed by Prof. R. De L. French, professor of highway and municipal engineering, McGill University. His paper appears elsewhere in this issue. A discussion of it was participated in by Prof. Peter Gillespie of the University of Toronto, who stressed the importance of graduate research work in connection with highway matters. He made a reference to a letter written over 100 years ago by Telford, one of the pioneers in highway engineering, in which Mr. Telford stressed the importance of hard practical work as the best mode of training a budding civil engineer.

A. W. Campbell, chief commissioner of highways for Canada, spoke of the lessons of the past and problems of the future in a paper to which more extended reference is made on another page. He was followed by A. F. Macallum, commissioner of works, Ottawa, Ont., who referred to some lessons that we have not yet learned. These he stated were: poor location of many roads, the placing of muck from the trenches on the roads from which it is washed back in the trenches, the lack of surface drainage and the use of too much fine stuff as a binder for macadam.

The method of conducting patrol systems as adopted in the state of Michigan was described by N. H. Neilson, deputy state highway commissioner of that state, whose paper, which was of great practical interest, is abstracted elsewhere.

In the evening the delegates were given a motor trip over a portion of the Toronto-Hamilton highway returning to Wabasso Park for dinner and entertainment.

* * *

Hon. Mr. F. C. Biggs was in the chair at the Wednesday morning session, which opened with the reading of a paper on "Methods for Reconstructing Old Macadam Roads." The paper was prepared by Mr. James Pearson, president of the Constructing & Paving Co., of Toronto, but as Mr. Pearson was confined to his home through illness, Mr. Marshall, of the Ontario Highways Department, read the paper, which is published elsewhere in this issue.

Mr. A. P. Sandles, of Columbus, Ohio, opened the discussion following the paper. With regard to macadam roads he stated there are more miles of this type of highway in use today than all other types combined and in addition to being the most used, it is the most abused. "Macadam was the first road that helped to get your country and mine out of the mud" he said, "and gravel roads should also be given credit for what they have done. In Ohio we have had a strenuous road building program, we have incurred debts, have issued bonds and increased taxes. We have had roads that were failures and which have caused a reversal of public sentiment and it is well to take note of these things. That is what your convention and your association should do. This reaction has not discouraged a forward road program, but has served to make us more cautious. Illinois is putting through a bond issue of $100,000,000 and Kentucky has proposed a $50,000,000 bond issue for road construction. That there is need for good roads, no one longer disputes. The biggest cost item, outside of schools, in Ohio, is road building and we believe we have received value for the money spent." He endorsed Mr. Pearson's policy of saving the old road bed, which, in many cases, makes the best foundation and in addition is a feature of economy, he pointed out. Some of the best road construction in Ohio, he claimed, had been secured through the use of the old road bed as a foundation, at a cost for the finished road of about $12,000 per mile.

Mr. Sandles then proceeded to read a brief paper which he had prepared on the subject under discussion and which we reproduce in full below:

A good road pays a dividend for every load. The highway of today is a greater factor in the affairs of men and nations than ever before in the history of the world.

Today we mix lightning with brains and gasoline and we have wonder wagons, autos, trucks and busses. In every worth while country these vehicles number millions. Because of these new carriers of folks and freight, speed and weight we have been forced to change and revise our blue prints, plans and specifications for road building. Since these new power wagons have wrought revolution in highway construction, we have deemed it wise to tax and collect toll from them to build, maintain and reconstruct the roads they ruin and wear out. Because of these gas-wagons, we must build wider, thicker and more durable roads at greater cost and then provide maintenance funds to insure that they endure and are fit for service.

Gone is the foolish notion that a permanent road can be built. For a time keen and shrewd salesmen were bold enough to proclaim that a road built or surfaced with their material would last forever.

This bubble soon "busted." Their theory trangressed the laws of nature the high speed auto and the high powered truck disputed all claims that a permanent road could be made. Decline and decay are the immutable laws that govern all things made by man. Even mountains wear away.

Road building has helped to make Britain's Empire great. Good roads follow the Union Jack. Trade and commerce have made England's vast domain to reach around the world. In the transportation trinity of waterways, railways and highways, the good road is a mighty link. Take from Canada her improved highways and this Dominion would indeed be unhappy.

Today road making is a science and a profession. The good road cause costs more money than any other item of peaceful government and is the best investment we make to insure good schools, good markets and the welfare of producer and consumer.

God was wise and good to haul and unload natural road material at most convenient places for man to use to make good highways. Stone and gravel are near at hand for most communities. I know that in Canada you have some sections that lack in this material.

After the road is built and after the investment is made, it is plain common sense to provide safety and insurance for this investment. Maintenance is the big word.

In my home state of Ohio, maintenance means:

1. Repair.
2. Resurfacing or "half-soling."
3. Reconstructing.
4. Saving and widening old road beds.
5. Drainage.

The master road builder will have in mind a few corner stones and guide boards to govern him in his program of making and preserving roads. The engineer and architect are mighty beacon lights that have helped to drive back the darkness and beckoned us to where we are. The world would be well nigh helpless today without the men who make blueprints, plans and specifications. To them we are all indebted. The master road builder when planning road construction will govern himself by these corner stones:

The location, the traffic needs, the construction, the soil conditions, the type and material, the drainage, natural and artificial, the maintenance, the load limits, the regulations, speed, seasons, etc., the financing, the beautifying, the future development of the country and possible increase in load weight and traffic, the width of right-of-way, the width of pavement.

The macadam road is easy to maintain, resurface, reconstruct and widen.

"Save the Surface and You Save All"

This is the slogan that made the varnish business pay dividends. It was the night-key that unlocked the door to profit for the varnish makers. The public mind caught the spirit of this slogan. Folks recognized that it was a boiled down sermon. Today, the world does not care to do without varnish.

After a good road is made, its surface should be saved. If this is done, then road building is a good investment. If it is not done, then road building is tragedy, extravagance and waste. Saving the surface means maintenance. Seventy per cent of maintenance is prevention. Thirty per cent of maintenance should be repair. Too often these percentages are reversed.

"A stitch in time saves nine." A dollar will do today what many can do tomorrow. No taxpayer's dollars should be used to pay for the building of a road unless provision is made at the same time for the maintenance of the road." These were the words of wisdom spoken by President Harding in his first official message to the Congress of the United States.

The president is a business man. He is a good "roadster" from the bottom of both feet up as far as he goes. He has frequently testified that no one thing has helped so much to make America prosperous and progressive as has our highway building.

At his first opportunity he emphasized the need and the importance of road maintenance and the need of engineering talent and leadership that will insure a policy of saving roads after we have invested many money millions in them. The taxpayers of the United States are glad to have the president on their side. Maintain roads or quit building roads. Business men will agree with taxpayers on this. If roads wear out before the bonds that built the roads wear out, public opinion will reverse the levers and order road making halted until a safe and sane policy is adopted and new leaders are at the helm. Folks will pray and pay for roads so long as they believe their road tax dollars are wisely invested. They need and demand good roads every day in the year. They are approaching a state of mind where they may not tolerate the waste and extravagence that are born in the womb of failure and neglect of maintenance.

If I read the signs aright in my own country, "Economy" is the big word that is being written across the sky where all can see and which public officials should heed. Taxes, bonds and debts are ghosts that haunt both the public treasury and the private pocketbook. It is not my mission to sound a wail of woe. Rather I would give a kindly word of warning to your country and to mine that now is not the time to pursue the ways of waste by neglecting highway maintenance. The mission of this splendid Good Roads Association is to be a barometer that will measure the actual conditions now existing in Canada and the mental frame of mind of your people.

Being devoid of selfish purpose, it is, in my judgment, your business to have this convention broadcast the message of economy and caution to all the people of your Dominion. If you have roads that need repair, do it now.

Your highway officials can practice economy by avoiding makeshift construction and makeshift maintenance. I do not charge that this is the policy of any of your road officials, but in the States, we have paid a penalty for this penny-wise and pound-foolish habit. We are getting over it.

Some of the ills of war are still upon us. This is not the time for any man or set of men to enrich themselves by excessive profits in road building. In my own country it has been said that there is more profit in new construction than there is in the maintenance of roads. My observation is that you are not afflicted in this way. There should be fair profits for everybody in both road building and road maintenance. The public, the taxpayer, the contractor, the material man, the laborer and the officials and inspectors should have some profit and share the blessings that flow from good road building.

Modern road machinery has kept pace with the forward march spirit of the age. It has multiplied man and horse power to such extent as to reduce the cost of road making to a point where we can better afford to have roads than we can to do without them. Without this up-to-date machinery and equipment, the cost of the type of roads today would be beyond our power to pay. Machinery to assist in maintenance and resurfacing roads is a good investment and good insurance.

He brought his remarks to a close with a message of encouragement to Canadian road builders. "When you give your time and money to promote the message of the Canadian Good Roads Association" he said, "you are building wisely, better than you know. I hope you go forward; hope you have the vision to see all the ramifications of the relationship of good roads to your country's prosperity. It is a man sized job and will take the biggest brains and broadest minds to work out the ideal of good roads for everybody, value for the road taxpayer."

* * *

Mr. E. L. Myles, County Road Engineer of Victoria County, Ont., followed with a paper on "Culverts and Small Bridges," which will appear in full in next week's issue.

Mr. Chas. Talbot, engineer of Middlesex County, Ont., introduced the discussion on Mr. Myles' paper with a brief address in which he defended the position of the engineer in the failure of some small bridge and culvert structures. In about 90 cases out of 100, he claimed, the work of construction is let to the lowest contractor bidding, with no regard by the owners as to his capabilities to execute first class concrete work. Yet the county or municipality holds the engineer responsible for the failure of this work which is absolutely due to incompetent workmanship. He endorsed the use of reinforced concrete in these structures and felt sure the extra first cost would be offset by the saving in maintenance.

* * *

Wednesday Afternoon Session

At the afternoon session, which was presided over by Mr. A. S. McMillan, Mr. J. S. Crandell, consulting engineer, of New York, gave an illustrated address on "Refined Tar in Construction and Maintenance," several excellent views depicting the various steps in the construction of a bituminous treated macadam road being shown. Some of the pictures illustrated the results where wrong materials or methods of applying materials had been used. The first part of Mr. Crandell's address dealt with the actual construction and the latter part with maintenance methods. He covered the subject thoroughly and his hearers, doubtless, derived a great deal of valuable information from his remarks. The majority of the pictures illustrated roads built in the United States, but views of sections of the Queenston-Grimsby, North Yonge St., Toronto Mount Pleasant Cemetery roads and roads of this type of construction at other points throughout Canada were also shown.

The Secretary of the Canadian Good Roads Association

Geo. A. McNamee, to whose efforts is largely due the success of the convention

Mr. A. F. Macallum, Commissioner of Works, Ottawa, with a few brief remarks on maintenance methods of tar treated roads, opened the discussion following Mr. Crandell's address. Among the points brought out in this discussion were the importance of using the correct size and quantity of stone for the various courses; care in rolling to see that stone, when of a soft quality, is not rolled too much, and in seeing that the rolling is done from both sides of the road to the centre and not from the centre out, which results in a surplus of material at the sides of the road; and proper care in the application of tar to secure correct penetration.

Mr. A. M. Jackson, County Engineer of Brant County, also read a paper at this session on "Cement Concrete" (Single Track), discussion on which was postponed owing to the scarcity of time and the number of items on the program still to be disposed of. This paper will appear in full in an early issue of the Contract Record.

Another paper read at this session and which will also be published in full in a subsequent issue, was on the subject "Bituminous Surfaces" by Mr. Irving W. Patterson, Chief Engineer, State of Rhode Island.

The president of the association, Hon. Mr. J. L. Perron, took the chair following the reading of the last paper, for the annual general meeting of the association. The usual business, the reading of the secretary's report, treasurer's report, etc., was followed by the election of officers, which resulted in the selection of the list of new officials as chosen by the Nominating Committee, with the exception of that body's choice for the presidency, Hon. Mr. P. J. Veniot, who was defeated in a vote of the meeting by Mr. Russell T. Kelley, a candidate nominated from the floor by Mr. A. F. Macallum, seconded by Mr. A. L. McFaul. The balance of the list of new officers are as follows: Honorary president, Hon. J. L. Perron; 1st vice-president, Hon. F. C. Biggs; 2nd vice-president, A. McGillivray; secretary-treasurer, Geo. A. McNamee. The new board of directors is composed of the following; Messrs. H. H. Shaw, G. Fred Pearson, A. S. McMillan, F. P. Regan, Jos. Beaubien, A. L. Caron, Col. F. M. Goulet, W. Findlay, T. J. Mahony, S. R. Henderson, S. H. Carpenter, J. D. Robertson and P. Phillip.

Annual Dinner

In the evening, the annual dinner and entertainment took place, the large banquet hall being completely filled with delegates and guests. Short speeches from provicial representatives and the guest of honor, Sir John Gibson, were received with an interest, the degree of which was indicated by the hearty applause that followed each speaker. Entertainment of a high order kept the guests enlivened.

* * *

Thursday's Session

At the last session on Thursday, the 14th., the business meeting was concluded by the reception of the report of the resolutions committee. In this report, which was unanimously carried, votes of thanks were given to the city of Hamilton, county of Wentworth, province of Ontario, the press and individuals and organizations which contributed to the success of the meeting. A resolution was also brought in to the effect that in view of the heavy investment that has been made for road work and the necessity of maintaining this investment intact, approval be given to such traffic regulations as are justifiable for economical reasons.

Two papers were presented—one on "Tourist Traffic" by John F. Pierce, passenger traffic manager, Canada Steamship Lines, Montreal, and one on "The Proper Use of the Highway," by J. F. H. Wyse, general manager Ontario Safety League, Toronto,

Lessons of the Past and Problems of the Future in Highway Development

A New Division of Responsibility for the Building and Upkeep of Roads Seems Desirable in Some Cases—The Necessity of Preserving the Capital Invested in Roads Demands Traffic Regulation

By A. W. CAMPBELL
Chief Commissioner of Highways for Canada, Ottawa

There is a great need in any large undertaking of determing well in advance what the objective or objectives are to be. Owing to changes in character, amount, weight and speed of modern traffic on their roads, most provinces in Canada now have or are aiming at establishing a provincial highway system. Centralization of control of road building work has become quite general in Canada. Owing to the burdens that local municipalities have been under in providing for not only their own traffic, but much outside long distance traffic, the different provinces have been obliged to assume responsibility for and control of main trunk highways connecting up the different municipalities. In four of our provinces, namely, Prince Edward Island, New Brunswick, Nova Scotia and British Columbia, the provincial highway system embraces all their roads. But, in these provinces, it has been found necessary to select a limited system of main trunk and primary roads. In the other provinces, the provincial system as first mapped out has undergone modifications and enlargements for various reasons. Thus, it appears, answers should be prepared by the administrators of provincial highway systems to such questions as: What is the object or objects of our provincial highway system? Is the system really representative of the whole province, passing from end to end? Is the system designed to fill missing gaps in heavy duty transport facilities? Are surveys carried out, having regard to the varying factor of traffic conditions?

Careful Planning of a Highway System

In this connection, it does appear to me that when it has been decided to establish a provincial highway system, one of the teachings of experience is the importance of careful planning of this system, and a classification based upon the requirements of traffic determined in advance, as far as practicable. When the policy and plan have been decided upon carrying out a uniform type of construction upon the main trunk highway system of a province, with an established standard of gradient, width of right of way, width of pavement, and having regard to varying traffic, standard types of surfacing, follows. This does not mean the construction within two or three years of the entire system, nor indeed, the completion of the major portion of such a system. It does mean, however, that when the objectives of the department have been determined, these objectives will be approached and gradually reached. This policy means, in brief, finding out what is and is likely to be the most economically efficient type of construction upon the highways of a province, and then give it to the public as fast as finances will permit.

Today, fortunately, as far as provincial highway work in most provinces is concerned, the improvements undertaken, from the initiation of the project to its completion, are in the hands of engineers. A few years ago, this was not the case, for the direction of the improvement of most was in the hands of laymen. Occasionally, an engineer was brought in to give his professional services, but it was not regarded as necessary to have a skilled engineer in actual charge of construction operations. The results were, therefore, usually very unsatisfactory from the public point of view, and also from that of the engineers so employed. The failures and mistakes that may occur in connection with provincial work today are due entirely to the engineers in direction of policy and in charge of carrying out the work on the ground. Here again, the importance of co-operation between field engineers and the chief engineer of a department, is obvious.

Caution in Spending Public Money

In general, it may be observed that it seems desirable that the responsible departments of highways bring to bear upon their work of planning and building provincial highway systems and their auxiliaries constructive deliberation, consulting all interests concerned. Advancing with caution, never very much in advance of public opinion, is always advisable when public funds are involved. A cautious man accomplishes more in the public interest in the long run than will a single tracked enthusiast. Caution is necessary in highway development—necessary to prevent reaction on the one hand and retrogression on the other. There are many ways by which this public work may be costly in addition to actual outlays. There is always the possibility of an important high-

A. W. Campbell

may [illegible] being costly when there is a repetition of the same type of construction. The public whose roads remain to be improved are quick to resent inordinate expenditures, though they may be actually called for by every reasonable expectation on the part of local enthusiasts, but which are not clearly apparent and called for by the facts of the case, having regard to their own more apparent and urgent need.

Owing to the fact that the earth road and the gravel road, which in most of Canada have been prevailing types of construction require constant attention in order that they may be at all uniform, there has been a strong disposition in many parts of Ontario, as elsewhere, to lose sight of the essential difference between construction and maintenance of better types. While it is true that proper maintenance work is the making of the earth or gravel road, in the past the neglect of constant maintenance nearly led to imperfect construction of these types. It does appear that as the patrol system of maintenance is becoming more generally adopted, greater appreciation is now and will continue to be shown for these types of construction. And it is a matter of surprise how well a properly maintained road can provide for the traffic of today, providing this traffic is light in character. However, maintenance of the higher types must also be provided, under a definite organization.

Traffic Regulation

One of the real problems in the future in highway development, is relating the advisable weight of traffic to the improvements laid down on different routes. In brief, this means, regulating the traffic, particularly commercial trunk traffic, so as to keep it off of roads which will be partially or completely destroyed, and keep it on roads which have been designed in part, at all events, to sustain traffic of this character. It should be possible for a motor trucking organization to go to a map of the highways of a province, and from the information there given, to decide whether it can economically, and in accordance with the regulations of the province, operate its equipment upon one road or the other to a given destination. This map should be so colored as to show the roads constructed, let us say of a rigid or semi-rigid type, of a flexible type, and of soft surface type. This information would be invaluable to the general touring public as well. This plan means saving our investment in improved roads, while giving the services in demand by different classes of traffic.

In the province of British Columbia there has been organized a committee representative of the municipalities of the Lower Mainland, the Provincial Cartage Association and other interested parties in regulation of the truck traffic with a view to not only the protection of the highway, but the development of commercial motor truck traffic. This committee is commencing to classify all the roads of the province as just indicated. Each type is expected to sustain only a gross weight of a different limited amount. One of the proposals which I am sure will commend itself to thoughtful students of the road question is to limit the permissible tonnage upon wheels with more narrow tires to a greater extent than upon wheels of wider tires. The question of differences in permissible tonnages, having regard to the varying amount of damage done to our highways by solid tires, as compared with pneumatic tires, is also under consideration. The worn solid tire of a heavy truck is a positive bane to any road, however well improved.

In dealing with this matter of regulation of traffic, according to the character of the tires of the vehicles, commendable legislation was recently passed by the province of Quebec. The permissible gross weight of commercial motor vehicles in the Province of Quebec, is as follows.

With non-pneumatic tires, five tons outside of cities and towns and six tons in cities and towns, or not exceeding 500 lbs per inch width of tire.

With pneumatic tires, six tons outside of cities and towns and twelve tons in cities and towns, or not exceeding 800 lbs per inch width of tire.

The minister of roads is authorized to grant a permit to an owner of a motor vehicle exceeding the above limit, provided the vehicle is confined to certain roads specified.

From the latter clause it will be observed that in this province too, the tendency is to specify clearly the roads upon which the new heavy duty traffic will be allowed to travel, excluding them from all others.

Putting Legislation into Effect

One of the incidental problems of the near future in connection with highway development is the institution of means to give real effect to provisions of motor vehicle legislation. In provinces having a well organized body of provincial police, it is a comparatively simple method to have constant patrolling by designated officials of the police in order to control and regulate the fast moving and heavy duty traffic. But in provinces where such an organization has not been perfected, it may be expected that such control of this traffic will not be a success unless other steps are taken to this end. In such cases, it would seem to be advisable to have such regulations as will, when infractions have occurred, make notable examples of offenders. The enactment of a law which will confiscate the vehicle for willful and wanton violation of absolutely necessary regulations of motor vehicle traffic would seem to be called for.

The history of the development of the roads of this country, as far as the incorporation of turnpike companies is concerned, has a rather important bearing upon a problem that is looming up today. In a number of communities, it was found half a century ago that provision must be made for building roads of the type that the system of road building of the day was unable to provide. The statute labor system was inadequate to the requirements of heavy duty traffic between some of the villages and towns of this province as well as elsewhere. Accordingly, companies were organized to provide the type of road required and were permitted to charge toll upon the users of their roads. These companies served a useful purpose in the development of good roads in these provinces. However, as the amount of traffic increased over toll roads, the imposition of a toll became burdensome to the traffic; and consequently, the toll roads were taken over by the municipalities in which they were situated or by the provinces themselves. Many municipalities have been providing transport service upon what were formerly toll roads, now for a number of years. However, these municipalities are now contending with the same problem that arose many years ago. There is a traffic which requires a type of construction much better than will serve the preponderance of the traffic using the former toll roads.

Much of this heavy traffic originates without the boundaries of such municipalities. It is a foreign traffic that contributes nothing to the construction or maintenance of the roads upon which it travels. While this traffic may conform to provincial regulations as to tonnages, speed, etc., it is responsible often for the rapid unraveling of the best waterbound macadam road and in some cases, for its complete destruction from foundations up. In such events, these municipalities are helpless to collect any return for the amount of damage done to their highways. The question therefore arises what steps should be taken to protect the investment being made by such municipalities in road adequate for local purposes and at the same time to secure from the operators of this heavy duty traffic some adequate return for the service being given to them, or that might be given. The question as to whether municipalities are in their own interest to be obliged to provide for exceptional traffic, much of it foreign, is one that is yet agitating the minds of members of road committees in many municipalities in the central provinces of the Dominion. These facts I venture to draw to your attention for the purpose, namely, that the future of the good roads movement may not be jeopardized by the call, sometimes heard, for nothing but the most durable types of construction upon all roads in all provinces. Uniformity of type of construction is, having regard to the financial limitations of today, both impracticable and undesirable. I am strongly convinced, now that the toll roads have been practically all abolished in Canada and that all the roads of the different provinces are free to public travel, providing it conforms to the statutory regulations, and that never again will any toll be exacted for any highway traffic. We must expect a certain amount of inter-provincial traffic, just as there is now a considerable amount of inter-county and interurban traffic. In so far as inter-provincial traffic may be regarded as foreign, to the same extent and to the same degree, interurban and intercountry traffic may be so regarded. The king's highway was never intended to end at provincial boundaries anymore than to end in the market centres of a given city. I trust that the good sense of Canadians of today and of tomorrow will ensure free passages over roads of this broad Dominion to any law abiding citizen, forever. But let us keep continually on the road to improvement.

Who Should Pay for Our Roads?

A Pressing Question in View of the Tremendous Expenditures Being Made on Highways—Should the Users of the Roads Pay the Cost Through a Tax on Gasoline?

By HON. E. H. ARMSTRONG
Premier of Nova Scotia

The importance and economic value of public roads has in recent years become a most practical problem. One has only to refer to the pages of past history to note what progress has been made in every Country that makes any pretense whatsoever to grapple with this problem.

When we realize that in 1763 it required from 14 to 18 days to perform the journey from London to Edinburgh by stage coach and compare those conditions with the rapid transit over hard surfaced highways of today, we have some conception of the tremendous advances that have been made.

The construction of public roads and their absolute necessity has been truly spoken of as one of our ancient and venerable institutions. In ancient as well as in modern times, the reason for building roads were and are recognized. The public roads of any country may truly be said to be an index of the character of the people.

In Canada we have made strides in the direction of improved highways, both from a national and a local view point. Who has paid the cost and who should pay the cost opens up a question suggesting a variety of answers—none of which will be either conclusive or entirely satisfactory. In the various provinces different methods of meeting the costs have been adopted, either temporarily or finally. I venture the opinion that until the extent and fuller conditions of the problem are fully understood, none of us can predict with certainty what may be done.

During the last three or four years very large sums of money have been contributed by the federal, provincial and municipal authorities towards the construction and maintenance of highways in Canada. I have no details of the grand total of these contributions. If the figures quoted by Mr. S. L. Squire are approximately correct, they will reach many millions of dollars. The autos alone in 1921 contributed in registration and licenses upwards of $8,000,000. The federal government under the terms of the "Canada Highway Act" up to the 31st March, 1923, had paid $9,788,404.98, out of a total of $20,000,000.

Vasts Amounts of Money are Spent

In Nova Scotia under the provision of this act up to the 31st December, 1922, we had actually expended on projects not all completed, $3,865,602 embracing some 468 miles. On this we have been paid $1,297,482. In addition large sums, chargeable to capital have been expended on provincial highways not included in projects coming within the provisions of the "Canada Highways Act." Last year we expended a total of $3,189,000. I quote these facts to indicate to some extent at least the magnitude of the cost, and so that those who should pay for it may take cognizance of the consequences.

In the United States last year, a total of $976,000,000 was contributed by federal, state and municipal authorities, and according to Mr. T. H. McDonald, chief of the U. S. Bureau of Public Roads, of a total of 2,800,000 miles of highways, 2,500,000 miles are yet to be improved. In the fiscal year 1922, 10,000 miles of federal aid roads and more than an equal mileage of highways without federal assistance were constructed. Fifteen years of building good roads lie ahead of the United States. Under the program which that country has adopted, there will be built 180,000 miles of improved highways, which will constitute the federal highway system. In addition there will probably be a greater mileage of state and local roads.

It is estimated that the total cost of the federal aid program alone will reach about $3,000,000,000 spread over a period of 20 years, or an average cost of $17,000 per mile. These are startling figures, and I am not surprised that the question uppermost in the mind of the public at large who feel that they are paying the cost is, "who pays for the road," and "who should pay for them?"

I am not familiar with the methods of providing for this cost in other provinces. In Nova Scotia, some years ago, the legislature reached the conclusion that the best way for us to deal with the problem was to place the responsibility entirely under the jurisdiction of the government. The government for a number of years has assumed the entire responsibility for the construction and care of every mile of highway in the province, whether primary or secondary. But with us, as with other provinces, the question must arise, can this continue, and if not, who should pay for the roads?

No one phase of the important problem of transportation is of greater national and local importance than that of good public roads. They are both the veins and arteries that supply the life blood of the railways and steamships. In these days when the minutest calculations are necessary to cut down the cost of production—efficient distribution of the products of the country are of primary importance. The good road is and must always be the chief contributor to this obvious economic principle. Not only does the nation as a whole, but the locality and the individual producer and consumer profit by the good roads. Trade and commerce will be stimulated and increased, thereby augmenting the revenue from customs and excise.

In Nova Scotia it was a popular slogan, "We want good roads and we are willing to pay for them?" Are we?

Should Motor Traffic Pay More?

The "Literary Digest," a few weeks ago had an article entitled "Who pays for the road?" I was much impressed with its suggestions. Like myself, it had not reached a conclusion. Who pays depends upon whether traffic is borne on rails or on a hard covered surface. In the United States it is estimated that motor traffic now carries but 15 per cent of the total cost of highway construction and maintenance, and the writer askes the very pertinent question, Should they not pay more? I do not know what the percentage in Canada is, but perhaps the question is a pertinent one here. The article proceeds to quote an article in a recent number of the "Railway Age." I admit that quoting a railway journal may not be quite free from bias, but its suggestions are so appropriate to the text assigned me that I am taking the liberty of quoting them.

"Who shall pay for the construction and maintenance of hard-surfaced roads to be ground to powder under the wheels of motor vehicles, of which many of the most destructive compete with the railroads for freight and passenger traffic? The growing use of motor vehicles for commercial purposes and the extension of hard-road systems to cover the entire country make this an important problem. The railroads and their patrons have a great deal at stake in the solution of it.

"There were approximately 10,500,000 motor vehicles in the United States in 1921, of which more than 1,000,000 were trucks, commercial cars, taxicabs and buses, engaged in the service of transportation. To a large extent, it is true, the service performed by this motorized fleet is supplemental to the transportation service performed by the railroads, but in many instances the two services are competitive. Whether motor vehicle transportation service is supplemental to or competitive with the railroads, however, does not alter the problem.

Railways Pay for Their Own Lines

"The railroads pay for the construction, maintenance and improvement of the roadways over which their trains pass, and that cost necessarily becomes a part of the nation's railway transportation bill. More than 1,000,000 motor vehicles used the public roads for commercial purposes last year. The amount which they paid for that privilege represents only a small fraction of the cost of construction, maintaining and improving the roadways which they helped to destroy. Last year the users of all motor vehicles paid about 15 per cent of the cost of road-building, and the other 85 per cent was paid by general taxation.

"The public at large has as great an interest in transportation by railroad as it has in transportation by the public highways. In fact, the benefits accruing from the use of the railroads are more wide-spread than the benefits accruing from the use of the highways by the more destructive vehicles—trucks, commercial cars, taxicabs and buses. It is no more equitable that those who do not derive immediate benefits from the destructive use of the highways should pay for them than that the public should be taxed for the cost of building, maintaining and improving the roadways used for rail transportation. It is important to note in this connection that the railroads pay a not inconsiderable portion of the taxes from which come the funds for 85 per cent of the road work.

"Every burden placed upon the railroads is burden upon their patrons. The railroads do not have an inexhaustible supply of funds out of which to pay operating expenses, taxes and other charges. A railroad is an institution organized for the giving of a great public service, in the performance of which certain costs are incurred, and these costs are charged back against the public in the form of freight and passenger rates. The shippers and passengers who use the railroads, therefore, pay the railroads. operating expenses, taxes and other charges as truly as if the railroads were not an intermediate involved party in the financial transaction.

"When the public gets that view of the situation—and it is the proper view—there will be fewer attempts to unload tax burdens and burdensome operating costs upon the railroads. And when the public comes to realize that cost of building, maintaining and improving the highways is not being paid by those who put them to a destructive use, a solution will be found for this problem."

Cost Borne by Those Who Benefit

The demand for the hard covered surface roads has come to stay, and those responsible must be prepared. Our great problem is to provide these roads in the most economical and equitable manner possible. To finance them, complete them, and maintain them without placing an undue burden on agriculture or any other interest. The protest against high taxes is not only national, but provincial and municipal, and very properly so. How can we procure the good roads without the additional taxation? Real estate asserts that it is taxed now to the limit. Manufacturers are complaining of increasing overhead charges and other vexatious forms of taxation. Capital is seeking for tax-exempt securities and investments. Our farming industry is not desirous of having placed upon it any additional burden. Then to what source of revenue shall we look?

Mr. R. N. Hubbard, chairman, Texas State Highway Commission in discussing the question in "Good Roads" thus summarizes the matter:—

"There seems to be only one fair solution, Let those who receive the benefit pay the cost. A just method of taxation can be evolved, that will fairly distribute the cost among those who do receive the benefits, at least as just as any scheme of taxation that can be devised.

"But who does receive the benefits? It would be easier to name those who do not. One trend of thought follows the theory that the users of the road should bear all the burden, not only of construction, but also of the maintenance. In the past we have constructed roads with the proceeds of county or district bond issue, mainly predicated on real estate values. This was the old idea of making the local people bear all the cost. In recent years we have begun to get away from that policy, raising annually a small state fund by the collection of a license fee from the owners of motor vehicles. It is small compared to the huge bond issue voted by the counties since the establishment of the state highway department, and also compared to the almost incalculable benefits received by the automobile owners from the improved roads.

"Our national Government has adopted the policy and principle of aiding the states in the construction of state systems on the theory that it is a general public benefit, based also on the idea that the states in turn, taking the same view, will provide state funds to match the federal money. Texas to date has not done this, but we have now come to the point where we will be compelled to do so, if we ever expect to see a state system, and if we continue to receive our portion of the federal road appropriation.

"In the construction of roads in the past, the burden placed upon the owners of real estate was perhaps justified. But the advent and rapid growth of the motor vehicle industry no longer justified a tax on real estate, except to the extent that the owner is benefited.

"However, to place the entire burden upon the user of the road would appear to be altogether unjust and unfair. Capital should bear its part of the cost of the improvement. Agriculture should pay only in the proportion to the benefit it gained. Commerce should pay its proportionate share, and finally the users of the road, including the capitalist, the manufacturer, the merchant, the farmer, and above all, those who are commercializing the roads for private gain, should all bear their part of the cost.

"In other words, it would seem that the more equitable way of solving the problem would be to divide the cost fairly between those receiving the benefits of the earning capacity of the road. No. road that does not return a fair interest on the investment is an economical or sound proposition. Its cost is indefensible. In measuring the earning capacity, that is an adequate return on the cost of the improvement, one must not fail to include the additional advantages afforded—better educational facilities, the happiness and contentment of our people, all most important factors for the consummation of which no price is too great."

Since this article was written by Mr. Hubbard, legislation has been adopted in many of the states of the kind that indicate at least a partial recognition of the suggestions he offers. By these several acts millions of dollars will be taken from the pocket of motorists in many states during the coming year, and the following summary has been furnished me:

"Texas appears to have passed the most radical increase. It is estimated that $10,500,000 additional will come from the pockets of motorists and wholesalers of gasoline. Two taxing measures dealing with automobiles were passed in Texas. One places a cent tax on each gallon sold by wholesale dealers, while the other revises the present system of motor license fees and increases them approximately 100 per cent. It is estimated that the gasoline tax will net the state $2,500,000 and the license fee increase will bring $8,000,000.

Indiana now has a law imposing a tax of two cents a gallon on gasoline estimated to yield $3,000,000 yearly. This will be devoted to good road purposes. In addition the legislature passed a law effective next January 1 increasing the license tax on automobiles.

"In Oklahoma a tax of 1 cent a gallon on gasoline was included in a bill passed by the legislature. This is expected to yield $900,000 annually. In Oklahoma City an ordinance recently passed puts the charge for a city license at 50 cents and is expected to yield $18,000 to the city. Tax legislation in Kentucky, passed in 1922, which became effective this year, is expected to net $300,000 to the state.

"In Ohio 87 bills directly affecting automobile owners were introduced in the legislature, but the only one that was passed increased the tax on trucks.

"Only one state showed a decrease. This was in Minnesota, where the method of taxing was changed. It was estimated that while the average car tax for last year was $17, the average for this year will be $16.44. However, the legislature passed a bill to submit a constitutional amendment to the voters at the next regular election authorizing the legislature to fix a tax on gasoline.

"In both Michigan and Iowa a tax of 2 cents a gallon on gasoline was passed by the legislature, but was vetoed by the governors.

"In Iowa a law was passed placing motor bus and truck transportation lines under the supervision of the state railroad commission, while a ton-mile tax was imposed on these lines to draw from them a contribution to the state highway maintenance fund. A law was also passed requiring that automobile registration fees be based upon current list prices."

In conclusion, I have suggested only the underlying idea, "that those who benefit should pay." The need of a careful survey of the whole problem thus suggested might be brought before the attention of the Canadian Good Roads Association. All I can further suggest is that it is a big problem, ever growing bigger, but now so big that the best study of all is essential but there must be united understanding and complete co-operation.

How Should Patrol Systems Be Operated?

The System Adopted by the State of Michigan for Handling the Maintenance of State and County Roads—Practical Methods of Keeping up Gravel Surfaces

By L. H. NEILSON
Deputy State Highway Commissioner, Michigan

This paper is written from the standpoint of practices developed from the experience of Michigan in handling the maintenance of her state trunk line road system through the county road organizations and in the methods developed by the Michigan counties in handling their state aid county systems. Opinions expressed and methods suggested are those best adapted to Michigan's soil, climate, traffic and other conditions.

Under our laws the counties pay from 5 % to 25% of the cost of construction and from 10% to 50% of the cost of maintenance. The state highway department lets the contracts for construction, and the counties handle the maintenance of the state line highways under an agreement providing for the return of the state's share based on quarterly statements of the cost of doing the work. The county maintenance organization handles the upkeep of both the state trunk lines and the county roads, thus saving duplication of overhead and equipment expense.

The present maintenance organization is headed by the state highway commissioner through his maintenance department which supervises the county organizations handling the work. The state is divided into nine engineering districts with a district engineer in charge, who handles all the work of the department in the group of counties under his supervision. He has assistants, one of whom is especially charged with supervision of maintenance work. The county road work is handled by a board of county road commissioners consisting of three members whose duties are administrative and who must hire an engineer or superintendent skilled in roadbuilding to handle all construction and maintenance.

The roads must lie on a county system approved by the state highway commissioner if state aid is desired. The qualifications of the county highway engineer must be approved by the state highway commissioner. The engineer must also be registered under the state law, providing for registration of engineers.

Where the county road system is extensive enough and the expenditures are large enough to warrant it a superintendent of maintenance, reporting to the county engineer is employed. Sometimes a county is divided into several districts with an overseer over each district who has direct charge of the patrolmen.

Maintenance Expenses are Budgetted

Under the system now in effect in Michigan a contract or agreement is drawn up with the county authorities covering the work for the ensuing calendar year. Each patrol section is listed with the men, equipment, material and money required to properly maintain it. To the total cost shown for the several sections is added the proper supervisory or overhead cost, the salaries of the superintendent and overseers and equipment rental or allowance. The agreement shows the share provided by law which shall be refunded by the state on the receipt and audit of the quarterly statements. Any extraordinary or emergency expenditure which would run the cost of any section or sections above the amount budgeted in the agreement must be approved by the district engineer and by the maintenance department before the work is done in order to be audited and approved in a quarterly statement.

Marking the trunk line routes with the proper numbers, direction and warning signs is done by the department crews and the cost charged back to the counties. Certain bridge repairs and steel bridge painting are handled by department gangs.

Each year estimates are gathered covering the amount of tars, asphalts and calcium chloride to be used for the season and bids taken for supplying the needs of the country organizations for these materials. Purchases are made for both county roads and state trunk line highways. Large savings have been made possible by this method. Another feature which is extremely important is that this blanket letting enables the setting up of a standard specification which all bidders, whatever may be the trade name of their product, are forced to meet. Tests are then made of the materials as furnished and it has been possible to secure uniform materials for the several kinds of work, such as surface treatment, penetration macadam, cold patch and joint fillers for concrete pavements.

Maintenance and construction work are now supervised by a landscape engineer with special reference to the preservation and planting of trees, shrubs, etc., so as to make the roadsides more pleasing to the eye.

Maintenance of Gravel Roads

Inasmuch as 50% of the 6,045 miles of the trunk line system, under maintenance in 1922, are gravel surfaced and more than 70% of the state roads are of the same character, it follows that gravel road maintenance is of primary importance.

On earth and gravel surfaces particularly, the patrolman is the fundamental unit upon which the whole organization is built up. He is placed in charge of a section, the length of which depends on the character of the improved road and the amount and kind of traffic to be carried. The usual section is three to five miles. He is responsible to his superior for the condition of the road surface, for the safety of the travelling public, for the legibility of markers, warning and direction signs and for the general appearance of the roadside. He should live near the center of his section if possible. The endeavor should be to secure and retain men who will stick to the job. Compensation should be on a monthly basis and should be based on results and increased with length of service. Work of this character cannot be done according to rigid specifications laid down in advance because of the widely varying nature of the soils, road surfaces and kind and character of traffic. It is therefore very essential that the job be made attractive to the man who will be observing and resourceful as well as a willing worker.

All necessary equipment should be furnished to the patrolman, who must be responsible for it while assigned to his section.

The first care of the patrolman must be to keep the road surface as near perfect as possible. He should begin work as soon as the frost is coming out of the ground in the spring. Early in the season it is often advisable to supplement his efforts with some gang work involving the use of heavy graders drawn by tractors to shape the road surface at the time it is most easily handled. Sod ridges formed on the shoulders through the preceding summer can easily be removed and the true cross section restored. All oversize stone should be removed before new material is added.

The early gravel roads were built without much regard for the size of stone or the sand, loam or clay content of the material. A large amount of oversize makes it next to impossible to keep a smooth surface. The present specifications call for a maximum size of ¾ inch with 75% retained on a screen having eight meshes to the linear inch. The problem of keeping a smooth surface on such roads is very much simplified. Too large a percentage of clay has resulted in roads that mud up and become rutted and rough. The maximum clay tolerance is 10% and there must be no lumps. In pits with a large amount of oversize the bank gravel is usually crushed so as to utilize all the material handled. All depressions and ruts should be kept filled. The gravel should be shovelled out of the truck or wagon unless a considerable amount is required when it can be best dumped out of an end dump truck.

New material should be available along the roads if the source of supply is at a considerable distance. Stock piles should be placed outside the shoulder lines and back of the ditches. Dragging should be done with a patrol grader or truck scraper. Good results can be secured with mechanical power but care must be taken to keep the speed down. Teams are very satisfactory because the speed can be kept down but often are too expensive because they can cover only limited mileage in a given time. Material must be added as fast as it is worn away and in sufficient amounts to leave a little to be moved into the ruts and depressions as the grader moves over the road. Where traffic is heavy it often becomes necessary to drag once or even twice a day regardless of weather conditions.

Frequent Dragging Desirable

With an adequate patrol maintenance system in operation the crown should be kept from four to six inches in twenty-four feet. This may be made a little higher as fall rains come and flattened out after the spring rains are over.

Resurfacing is required periodically and care should be taken to use clean, properly prepared material, free from clay or loam, with a maximum size of ½" or ¾". The large amount of pleasure car traffic on our main traveled highways is making the elimination of dust imperative. Good clean patching and resurfacing gravel helps to accomplish this.

Heavy resurfacing work should be done early in the spring or late in the fall so that the traveling public will be as little inconvenienced as possible.

Calcium chloride has been used with very good success as a dust layer both in the flake and the granulated form.

Old Macadam Need Not be Scrapped

By Reconstruction its Serviceability May be Retained—As a Base for Higher Types of Surface it Has Demonstrated its Usefulness—Methods of Salvaging

By JAMES PEARSON
President, The Constructing and Paving Co., of Ontario, Limited

It has long since been said and truly that the most important element that lies at the root and beginning of a nation's progress and that which is indeed the greatest part of the foundation of a country's civilization is a system of good roads. Roads are the veins and arteries by means of which the circulation of the social body is carried on. When they are clogged the march of civilization is retarded.

Recognizing the importance of good roads to the welfare and progress of the country long ago Great Britain set to work to place herself in the forefront of the civilized world in the quality and extent of her good roads, and by the year 1820 she boasted of having a length of 114,829 miles of pike-roads and improved highways. In fact, it has been said that the Union of England and Scotland had been brought about more by the construction of good roads extending north and south than by any knightly compact.

It was during this road construction period that John L. McAdam, a Scotch engineer, came to the fore with his method of road construction which retains his name, and the general use of which has since spread to all civilized countries.

This new construction consists of the use of a hard stone broken to pass through a 2½ in. ring and then deposited evenly in a bed of from 6 to 12 inches in thickness, and which becomes through travel compact and at the same time furnishing a smooth wearing surface. This result was not the invention of a day. The author spent years experimenting at his own expense, so that finally on the report of a committee, the House of Commons in 1823 recognized the success claimed for the method and made a grant of £10,000 to the inventor to cover his expenses and in recognition of his great public service.

The chief advantage claimed for this class of road construction was the economy in avoiding the great expense of the heavy stone foundations in previous use, and the facility of construction.

The facility with which this road can be constructed and at moderate cost wherever broken stone is available has caused its extensive use in all civilized countries beyond that of any other class of improved roadway, particularly in the construction of country highways. Even our towns and cities until the advent of portland cement and asphalt were largely dependent on this class of pavement for their residential streets.

Although there has always existed this demand and necessity for good roads there never was a time that compared with the present wherein the welfare, comfort and enjoyment of the people at large depended so much on good roads suitable to the varying conditions of traffic. We have in the automobile, developed during the past twenty years, a means of locomotion, useful in business as well as pleasure, in which we may get about at a speed equal to that of our fastest trains, provided our roadways are of a sufficiently smooth and durable character to stand up under this rapid and heavy traffic. Vehicles travelling at the rate of from twenty to fifty miles an hour and some carrying as high ts ten tons at a load require an up-to-date smooth and durable road surface.

New Road Standards are Required

This condition as to the service of our roads are called on to meet has, it may be said, largely revolutionized our rural road building standards and designs. Roads that met the requirements of ordinary vehicular traffic prior to the introduction of the automobile are unequal to meet the present requirements.

This changed condition of traffic in the use of our rural roads brings us face to face with the important question of what use we can make of our existing roads in the construction or reconstruction of roads to meet present requirements.

We have in Canada a large mileage of old water bound macadam roads to which are being added many miles of new road, now under course of construction. As time goes on these will require repair and reconstruction, and in the method of reconstruction where an up-to-date hard wearing surface is necessary, such as sheet asphalt or asphaltic concrete requiring a rigid base, the question arises to what extent and how can this old macadam roadbed be utilized so as to economize in the cost of construction by making use as far as possible of the expenditure already incurred.

Old Macadam Makes Good Base

That an old macadam makes a good base for asphaltic wearing surfaces has been demonstrated and proven throughout the United States by its general adoption in many of its large cities. New York, Chicago, Philadelphia, Washington, Boston, Portland, Baltimore, Detroit, etc., furnish many hundreds of miles of examples of its success. In an article recently issued by the Asphalt Association under the heading of "Salvaging Old Pavements by Resurfacing with Asphalt" many examples are given of the success of old macadam as a base for an asphalt wearing surface.

In the city of New York a number of the most heavily travelled streets have had asphalt surface laid on old macadam base. Broadway from 59th to 79th streets was laid in this manner in 1890, and the pavement gave good service for 22 years. A renewal of the pavement was largely due to subway excavations. Lennox Avenue between 110th and 124th streets was surfaced with asphalt over old macadam in 1904 and is still giving good service.

Detroit, Mich., has obtained excellent results from resurfacing old macadam with sheet asphalt. Superintendent C. A. Proctor reports that 390,171 square yards. as having been laid between 1913 and 1919 at a cost of $1.40 per sq. yd.

This article states that in 1912 a rather extensive policy was begun in Borough of Queens, New York City, of making use of the existing macadam roads as foundations for asphaltic surfaces. The engineer of highways considers it both desirable and economical to use old macadam as a foundation for a new asphaltic surface. "This method of construction has been giving success since 1912 at a comparatively small initial outlay. In 1912 some 60 miles of old macadam were surfaced in this manner at an average cost of but $1.11 per square yard. This price includes shaping up the old macadam and laying a two inch asphaltic concrete surfacing with a 5 year maintenance guarantee. In February 1920, the Bor-

Delegates at the Tenth Annual Convention of the Canadi

ough of Queens had 80 and 90 miles of old macadam which is being used as foundations for asphaltic surfaces. These are giving good service."

The article further estimates the salvaging values of the 100,000 miles of water bound macadam and 154,000 miles of gravel roads existing in the United States on the first of January 1922 as $190,000,000 a year for a period of six years, almost all of which is lost if they are replaced with some other type of construction, not to mention the additional cost of removing the old material. On the other hand, this $190,000,000 may be conserved if the old roads are utilized as foundations and most of them are adaptable for such use. Thus in the aggregate it is a matter of great economic importance that they be salvaged wherever possible.

Examples in Canada

While this extensive use of old macadam as a base for up-to-date asphalt pavements has been going on in the United States we in Canada have made a very limited use of our old macadam for this purpose. In the city of Toronto a number of old tar macadam streets have been surfaced with sheet asphalt with good results, showing no signs of want of stability as a rigid base after many years of use.

oads Association, Hamilton, Ont., June 11-14

In 1917 that part of the Dundas Road from Lambton to Summerville, Ont., a distance of about four miles, and known as the "Eaton Road," an old water bound macadam was surfaced with a two inch wearing surface of asphaltic concrete. The conditions under which this work was done were vary unfavorable. There was a limited sum of only $14,250 a mile available, so that the expenditure had to be kept within this limit. Then the war being on and all stone crushing plants shut down, there was no proper sized screened broken stone available, so that the work had to be done mostly by the use of a gravel surface mixture. Notwithstanding these adverse conditions this road after six years wear stands as additional evidence that an old macadam does make a good base for an asphalt wearing surface.

Another of our examples of an old macadam making a good base is the main street of the city of Owen Sound, Ont., which was reconstructed four years ago, using the old macadam road as a base. It is reported by the city engineer to be in first class condition.

Methods of Using Old Macadam

Having established beyond question the practicability of using old macadam roads in the constructing of the necessary rigid base as a support for an asphaltic wearing surface and the economy thereof, we will consider and give some of the details of the methods or specifications for the carrying out of this work. These will vary somewhat according to the condition of the old road. It may be so badly revelled and worn into ruts as to necessitate scarifying, reshaping, evening up and binding, or it may present a well bonded surface but uneven and containing numerous holes and depressions.

Where scarifying is necessary it should be done with care and to the least depth necessary so as to disturb the bond or compactness of the road as little as possible. If extra width is necessary it should be effected by trenching along the old macadam and building up the proper grade with new material, well compacted, or what would be better still, by the use of an asphaltic macadam or black base. If the crown of the old road is too high for an asphaltic surface this may be remedied by scarifying and scraping the excess material towards the sides, but if the depth of the old material is not sufficient for this, new material must be used to even up the surface to the proper crown. It is more preferable to build up the sides than to cut down the crown unless where there is an extra depth of old material, keeping in mind always that the least disturbing of the old roadbed possible, the better.

The mineral aggregate used in building up the old base where additional depth is necessary should be of clean broken stone or mine trailings of a reasonably uniform size, carefully spread and rolled until compacted.

The shoulders may be a concrete curb or as on the "Eaton Road," a three foot width of asphaltic macadam, penetration system, which has given good service.

When the roadbed is completed ready for the

(Continued on page 618)

Construction Developments During the Month of May

Figures Compiled by MacLean Building Reports, Ltd., Show Trend of Building Activities for Last Month—Details of Contracts Awarded in Eastern and Western Canada

Construction Contracts Awarded in Eastern Canada, May, 1923

	Ontario		Quebec		New Brunswick		Nova Scotia		Eastern Total	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Apartment	11	$ 308,500	15	$2,080,000	....	$..........	....	$..........	26	$2,388,500
Churches	7	137,000	3	232,500	2	35,000	....	....	13	554,500
Factories	18	542,500	6	287,500	....	....	2	70,000	26	900,000
Garages, Public	12	73,500	10	113,600	1	3,000	....	....	23	190,100
Hospitals	2	70,100	....	....	....	....	....	....	3	160,100
Hotels and Clubs	8	92,000	5	115,000	1	15,000	....	....	14	222,000
Office Buildings	6	364,000	3	117,000	....	....	....	....	10	483,000
Public Buildings	6	194,200	1	7,000	1	3,000	1	1,500	10	221,700
Residences	1513	7,467,700	490	3,048,300	11	73,000	20	88,000	2066	10,693,000
Schools	23	1,055,900	5	351,000	....	....	....	....	28	1,406,900
Stores	65	1,338,000	25	229,000	2	25,000	2	19,000	94	1,611,000
Theatres	2	53,000	....	....	....	....	....	....	2	53,000
Warehouses	13	1,951,100	5	244,000	....	....	1	7,000	19	2,202,100
Total Buildings	1716	$13,647,500	568	$6,824,900	18	$154,000	26	$185,500	2334	$21,085,900
Bridges	9	187,400	....	....	2	12,400	....	....	11	199,800
Dams and Wharves	2	65,000	....	....	1	50,000	2	32,000	5	147,000
Sewers & Watermains	12	190,400	1	2,500	1	36,000	....	....	14	228,900
Roads and Streets	100	7,184,800	25	1,143,000	12	140,000	30	166,000	172	8,683,800
General Engineering	17	1,775,000	7	1,575,000	....	....	....	....	24	3,350,000
Grand Total	1856	$23,050,100	601	$9,545,400	34	$392,400	58	$383,500	2560	$33,695,400

Construction Contracts Awarded in Western Canada, May, 1923

	British Columbia		Alberta		Saskatchewan		Manitoba		Western Total	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	....	$..........	1	$ 15,000	....	$..........	1	$ 3,000	2	$ 18,000
Churches	2	8,600	1	60,000	2	12,500	2	19,000	7	100,100
Factories	12	2,818,000	3	21,700	3	24,000	....	....	18	2,863,700
Garages, Public	3	33,500	1	1,000	1	2,000	4	29,500	9	66,000
Hospitals	....	....	1	150,000	1	5,000	....	....	2	155,000
Hotels and Clubs	5	57,000	2	11,000	2	6,500	....	....	9	74,500
Office Buildings	1	5,000	....	....	1	3,200	2	6,500	4	14,700
Public Buildings	2	9,000	....	....	2	9,500	....	....	4	18,500
Residences	127	551,900	53	188,200	69	265,200	257	792,300	506	1,797,600
Schools	6	56,200	2	140,800	9	54,300	1	39,500	18	290,800
Stores	9	34,800	6	20,600	8	47,100	6	63,000	29	165,500
Theatres	....	....	....	....	1	8,000	....	....	1	8,000
Warehouses	6	175,500	3	51,000	3	131,000	1	200,000	13	557,500
Total Buildings	173	$3,749,500	73	$ 659,300	102	$568,300	274	$1,152,800	622	$6,129,900
Bridges	3	63,000	....	....	....	....	....	....	3	63,000
Dams and Wharves	1	55,000	....	....	....	....	....	....	1	55,000
Sewers & Watermains	6	145,400	....	....	....	....	2	12,300	8	157,700
Roads and Streets	2	100,700	1	42,900	9	150,500	2	16,100	14	310,200
General Engineering	2	286,000	....	....	....	....	....	....	2	286,000
Grand Total	187	$4,399,600	74	$702,200	111	$718,800	278	$1,181,200	650	$7,001,800

Summary of Construction Contracts Awarded in Canada during past 5 months

	Ontario		Quebec		Maritime		Western		Dominion	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	29	$1,041,000	24	$3,498,000	3	$ 33,500	4	$ 39,500	60	$ 4,612,000
Churches	25	1,119,000	17	904,000	3	185,000	10	122,100	55	2,330,100
Factories	72	5,926,000	30	1,536,100	8	165,000	36	6,069,700	146	13,696,800
Public Garages	31	291,200	20	224,600	1	3,000	23	151,900	78	670,700
Hospitals	5	252,100	....	....	2	160,000	4	217,600	11	629,700
Hotels and Clubs	23	738,500	14	368,000	4	31,500	16	209,700	57	1,347,700
Office Buildings	33	1,142,000	10	3,185,800	2	14,000	18	291,000	63	4,632,800
Public Buildings	27	838,900	6	2,402,000	5	123,500	15	321,900	53	3,686,300
Residences	4531	22,681,900	1276	7,000,000	53	257,400	960	3,550,500	6820	33,489,800
Schools	56	2,254,600	20	1,810,800	1	1,500	36	1,047,500	113	5,114,400
Stores	190	4,186,800	65	1,182,500	15	126,000	95	885,500	365	6,380,800
Theatres	2	53,000	....	....	1	19,000	3	14,600	6	86,600
Warehouses	35	5,883,100	17	3,007,000	1	7,000	34	892,200	87	9,789,300
Total Buildings	5062	$46,408,100	1499	$25,118,800	99	$1,126,400	1254	$13,813,700	7914	$86,467,000
Bridges	16	623,600	21	518,000	13	119,500	20	245,600	70	1,506,700
Dams and Wharves	7	640,100	5	1,082,300	9	193,600	5	351,100	26	2,267,100
Sewers & Watermains	43	803,100	5	77,500	1	36,000	11	318,200	60	1,234,800
Roads and Streets	149	9,666,300	78	3,508,800	48	361,000	18	895,200	293	14,431,300
General Engineering	35	4,730,700	18	2,489,600	12	807,500	9	713,700	74	8,741,500
Grand Total	5312	$62,871,900	1626	$32,795,000	182	$2,644,000	1317	$16,337,500	8437	$114,648,400

Hints for the Contractor

Electric Hoist Monorail System for Laying Sewer Pipe

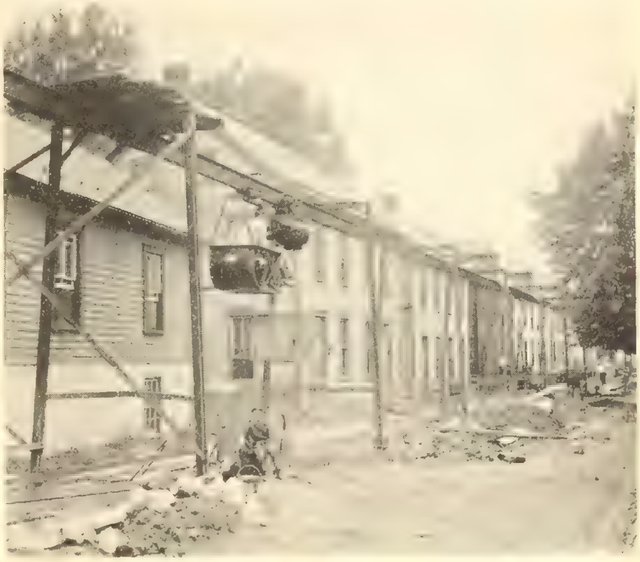
A most effective method of laying sewer pipe has been put into operation by a contractor in Hagerstown, Maryland, which will appeal to contractors doing similar work or confronting like conditions.

Confronted with narrow streets and the necessity for keeping them free from the usual obstruction that results with the removal of dirt, this contractor employed a system whereby he might dig his trenches, lay his pipe and cover the completed work, progressively.

This was accomplished by using the portable monorail, electric hoist system illustrated in the accompanying line drawing. The simplicity of the design and construction makes the drawing immediately self-explanatory.

Not only does this system do away with the necessity of obstructing streets and sidewalks with dirt, but it cuts the cost of operation in half. This, because the dirt is handled only once instead of twice—the digging of the advance trench, the laying of the pipe in the dug trench and the covering of the completed work being done simultaneously.

The system, which is assembled in sections, trolly included, has but one requirement, that of access to electricity. This can usually be had without difficulty. By merely backing a heavy truck against one end, the whole structure is easily and readily moved along the T-rails. This is done as the work progresses. The electric hoist used on this outfit is of the "C-2" type with a capacity of three thousand pounds, amply capable of caring for the deepest sewer or the heaviest pipe. Because of the exceptionally low first cost, coupled with the low operating and maintenance expense, this system is profitable on small as well as large jobs.



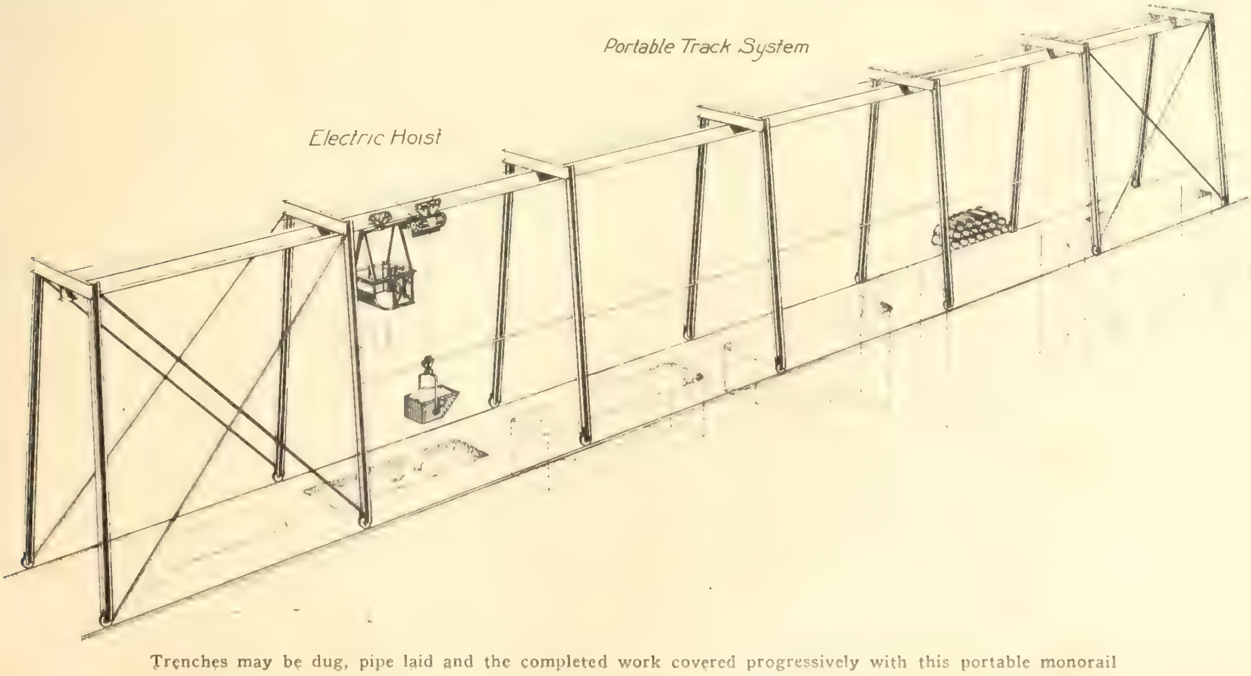
The electric hoist and monorail in operation

The accompanying halftones show this system in operation. The system was designed and erected by the Link-Belt Company of Philadelphia.

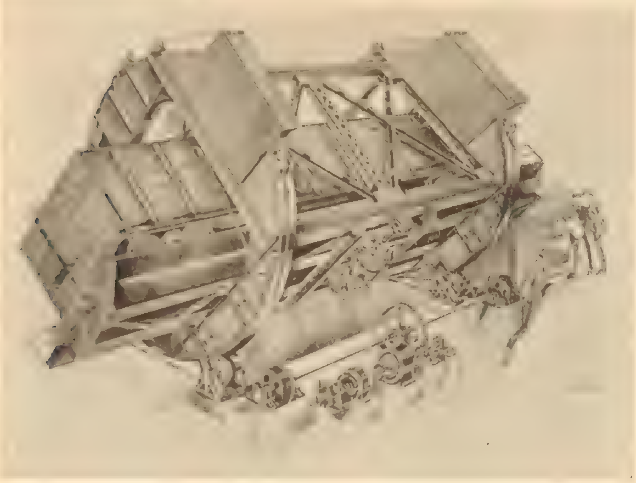
New Gondola Car Dumper Designed by the Link-Belt Company

One of the outstanding engineering achievements of the year is the simple, efficient, fool-proof and comparatively low-priced gondola car unloader designed and now being built by the Link-Belt Company of Chicago.

The idea of building a cradle sufficiently large and



Trenches may be dug, pipe laid and the completed work covered progressively with this portable monorail powerful to support and rotate a full sized, standard gondola car is, to the average mind, a Herculean feat. Enormity, complexity and massiveness are at once brought to the mind of the uninitiated.


Gondola cars may be easily unloaded with this dumper

Yet so simple is its construction and so well balanced in design that it is not only very reasonable in size but it can be operated by anyone, however unskilled. It requires but 35 to 45 h.p. to operate. Its efficiency is readily recognized by its ability to handle forty cars an hour.

The accompanying illustration clearly shows the simplicity of construction and the general function of the unloader.

When unloading a car of coal or other material and the machine started to operate, the car is supported by a long, fixed platen upon which the entire side of the gondola rests when being rotated. At the same time, and operated by a time-switch, the top clamps descend and hold the car on the rails by an absolutely equalized pressure at all four points. The dumper then turns over, discharges its contents into a pit or hopper below, returns to an upright position and automatically releases the car, thus making it ready to be pushed off the dumper for the successive car.

Any gondola car of standard design can be unloaded with the new Link-Belt gondola car unloader. Variation in length, width, height, capacity or weight does not affect the dumper or its unloading ability. So well balanced is the whole mechanism that there is no necessity for "spotting the car" in any exact spot.

For operating, nothing is required except the movement of a lever similar to the control lever on a street car. Owing to this, the most unskilled laborer can be employed as operator.

How Should Water Meters be Selected?*

Types of Measuring Devices for Domestic and Commercial Service—Recommended Tests and Equipment Necessary for the Determination of Registration and Capacity

Service meters in use for measuring water delivered to domestic and commercial consumers are divided into four general classes, as follows: displacement, current, compound and fire service.

Displacement Meters. There are a number of different types of displacement meters on the market which are known by the motion of the piston, as, reciprocating, rotary, oscillating and nutating disc meters. These meters are positive in action and displace or carry over a fixed quantity for each stroke or revolution of the piston or disc.

Displacement meters are manufactured in sizes from ⅝ in. to 6 in. They are suggested for universal use on supply lines to dwellings and for use in other locations where accuracy of measurement is a primary consideration.

Current Meters. There are several different types of current meters on the market which differ from each other mainly in the shape of the water wheel or propeller. These meters are not positive in action, but record the flow by the number of revolutions of their water wheel or propeller, which is set in motion by the force of the flowing water coming in contact with the wheel or propellor blades.

Current meters are manufactured in sizes from 1½ to 20 in. These are cheaper in first cost and maintenance and offer less obstruction to the flow of water through them and therefore give a greater discharge with the same loss of head than displacement meters. They are not sensitive to small flows, and not as accurate and reliable as meters of the displacement class on the larger flows.

Meters of the current type are appropriate where a free discharge and heavy service is demanded, as for example: railroad standpipes, elevators, water carts and water motors.

Compound Meters. Compound meters consist of the combination of a main-line meter of the current or displacement type for measuring large flows and a small by-pass meter of the displacement type for measuring small flows, together with an automatic valve mechanism for diverting the small flows through the by-pass meter.

The automatic valve, which is of the differential type, remains closed until the flow is large enough to create a fixed difference in pressure between the inlet and outlet side of the valve. The by-pass meter measures the small flows that otherwise would not be measured or would be measured in part only by the main-line meter. Compound meters are manufactured in sizes from 1½ in. to 12 in. They are suggested for use in cases where flows through the meter cannot be confined to rates within the accuracy limits of a single meter.

Fire-Service Meters. Fire-service meters are compound meters consisting of a main-line meter of the proportional type for measuring large flows and a small by-pass of the displacement type for measuring small flows together with an automatic valve mechanism for diverting the small flows through the by-pass meter. The combination is designed to afford a clear passage through the meter when the valve is raised from its seat.

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*Extract of a report submitted last month to the American Water Works Association by the Joint Committee on Standard Specifications for [illegible]

Fire-service meters are manufactured in sizes from 3 in. to 12 in. They are the type required by the Fire Underwriters on sprinkler or fire hydrant connections if minimum fire insurance rates are to be secured. The measurement of flow recorded on the main-line meter is liable to be inaccurate unless careful attention is given to keeping all parts of the meter in good working condition. When the flow through the meter is such as to bring the main-line meter into use, only a relatively small portion of the total flow actually passes through the main-line meter. This increases the liability of serious error in the registration of the water passing through the meter.

Maximum and Minimum Lengths of Meters

A standard over-all length has been fixed for each size disc meter. Due to the large variation in the over-all length of each size of current and compound meters that exist among the various makes of meters, it has been found impracticable to fix a standard over-all length for these types. A filler piece can be inserted to increase the length of the shorter meters. Manufacturers are prepared to supply these filler pieces when required.

The following minimum and maximum over-all lengths, in inches, of the various sizes and types of meters is given to aid those who may desire to provide space for the maximum length of any meter:

		Current		Compound	
Size Inches	Disc Standard Length	Minimum Length	Maximum Length	Minimum Length	Maximum Length
5/8	7½	—	—	—	—
¾	9	—	—	—	—
1	10¾	—	—	—	—
1½	12⅝	13	15¼	18 5/16	18 5/16
2	15¼	15¼	19	15¼	28⅞
3	24	20	24	24	37⅛
4	29	22	29¼	29	39¼
6	36½	24	36¾	36	50¾
8	—	26¾	48¾	42	61¾
10	—	30	60	63½	72¾
12	—	36	70	64½	77

Tests of Meters Recommended

The tests to be made on the meter are divided into two classes; 1.—capacity test; 2.—registration test.

Capacity tests are those which test the design of the meter rather than the workmanship thereof. When a meter of a given make has once been tested for capacity it should not be necessary to again test this type of meter unless a change has been made in its design.

The registration test should be made on each meter, as the results are affected by workmanship and assembly of individual meters. There is no certainty that, because one meter of a given make comes within certain limits of accuracy, another meter of the same make turned out by the factory on the same day will necessarily give similar results. The register furnished with each meter should be used by both the manufacturer and purchaser in making registration tests.

The registration tests recommended are as follows:

All meters should be tested for accuracy of registration within and as near as practicable to the low and high rates given under "Normal Test Flow Limit." Occasionally additional tests should be made at one or more intermediate points.

A test at the "Minimum Test Flow" should be made on as many as possible and not less than 5 per cent of the meters. If the results obtained from testing 5 per cent of the meters show that any meter does not comply with the low-flow requirement, additional meters should be tested to the extent deemed necessary to make certain that the other meters do comply therewith.

The accuracy of compound and fire-service meters within the "change over" range should be determined by making a sufficient number of tests at different rates of flow between the high and low rates given under "Normal Test Flow Limits" to enable the construction of a representative accuracy curve. The rates of flow at the beginning and end of the "change over" and the maximum error in registration can readily be determined from this curve.

A test for accuracy at the "change over" should not be necessary on all meters since this is a test of design rather than workmanship.

Attempt should not be made to test large-size meters if the higher rates of flow necessary to make a proper test cannot be obtained with the apparatus available. The pressure test should be made on each size of meter furnished of a particular type. This pressure is to be 150 lbs. per sq. in. and the pressure may be furnished through the use of a hand pump or such other method as may be available. Before the meter has been tested by static pressure and also after it has been so tested, it should be tested for accuracy to see whether the meter has been so distorted as to affect registration. It is considered unnecessary to make a pressure test of each size of meter or a given type more than once if satisfactory results are obtained.

If it be possible to give a working-pressure test under 150 lb. per sq. in., then such a test should be applied rather than a static-pressure test.

Where the purchaser does not have the necessary equipment to test the meters, there should be furnished by the manufacturer a certificate that each meter has been tested for accuracy of registration and complies with the standard specifications in this respect, and that the size and type of meter furnished has complied with the capacity requirements. When compound or fire-service meters are purchased, the certificate furnished by the manufacturer should include a statement to the effect that the size and type of meter furnished has complied with the standard specifications in respect to registration of flows within the "change over" from the by-pass meter to the main-line meter.

Equipment Necessary to Test Meters

The standard specifications require that meters shall accurately record the flow within certain limits and shall pass a given quantity of water with a maximum loss of pressure. Suitable equipment to make accurate tests must be available before the purchaser should make complaint of meters not complying with the specifications.

The minimum test equipment required for registration and capacity is as follows:

1. A quick-acting valve on the supply pipe through the use of which the flow can be started and stopped without appreciable loss of time.

2. A valve on the outlet side of the meter which can be used to establish the rate of flow desired.

3. Pressure gauges connected on both the inlet

and outlet of the meter to show whether any material change in pressure occurs during the period of test which would affect the rate of flow. The outlet pipe is to have sufficient head on it so that the meter will always have pressure on its outlet end and preferably not less than 5 lb. per sq. in.

4. A measuring device which may be either of the volumetric or weighing type. Whichever is used, the accuracy of determination of the volume or weight of water discharged into the measuring device must be such as to bring the limit of error within one-tenth of 1 per cent. The volume of water passed must be sufficient to cause at least one revolution of the pointer on the initial dial except for test at "minimum test flow" rate. For the latter test, the amount passed shall not be less than one cubic foot.

It is desirable to have available for testing meters a test table and appurtenances which are manufactured by several concerns. Such an outfit would include the equipment enumerated in the preceding four paragraphs.

For the capacity tests, it is necessary to add to the above equipment, two piezometer rings which must be of exactly the same diameter. The piezometer rings must be free from any burrs where the holes are drilled through the wall of the ring and not less than four holes shall be provided, drillel in pairs and on diameters at right angles to one another. The inlet piezometer ring shall be set close to the meter and shall be at a distance of not less than eight diameters from the nearest upstream stop-cock or fitting in the supply pipe. The outlet piezometer ring shall be placed at a distance of not less than eight nor more than ten diameters from the outlet of the meter. The diameter of the piezometer rings and inlet and outlet pipes shall be the same as the size of the meter to be tested. The piezometer rings are to be connected by either rubber or metal tubing to a mercury U-tube. To this U-tube is to be attached an accurate adjustable scale for measuring the differences between the inlet and outlet pressures. Provision is to be made for the complete removal of air from the tubing connected with the U-tube, and the U-tube and the tubing connected therewith are to be so placed that the air will rise to the outlets. Where relatively high flows are to be recorded, it is necessary to read both sides of the mercury column to compensate, as far as practicable, for irregularities in the diameter of the glass U-tube, and such readings are to be made as nearly simultaneously as possible to avoid errors due to fluctuations.

Information to be Furnished to Meter Manufacturers When Requested to Submit Bids on Meters

1. Meters shall conform to the standard specifications for cold water meters, ... type, adopted by the American and New England Water Works Associations.

2. The manufacturer shall state in his bid the type of meter he proposes to furnish, as listed in his catalogue. The actual capacity of each size of meter called for is to be given graphically from 0 lb. up to 25 lb. loss of pressure. If this capacity be stated in the manufacturer's catalogue reference may be made thereto.

3. No bid will be considered on meters of a design which has not been listed for at least one year in the catalogue regularly issued by the manufacturer.

4. The method of testing meters shall conform to that recommended by the committee on standard specifications for water meters.

5. (a)* The meters are to be accepted on a certificate furnished by the manufacturers that the meters have met the requirements of the standard specifications for water meters, as adopted by the American and New England Water Works Associations.

(b)* The meters will be tested by the purchaser to determine whether they do or do not comply with the standard specifications for water meters adopted by the American and New England Water Works Associations.

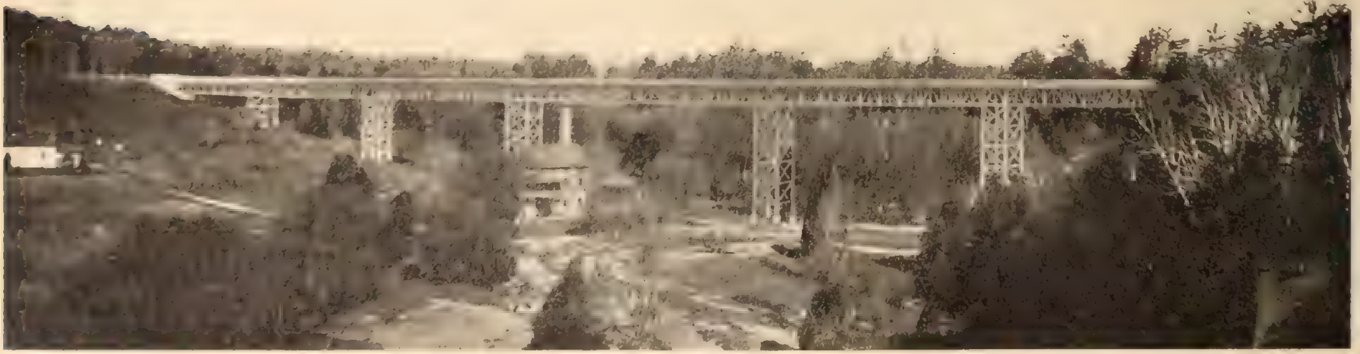
6. Registers shall be $\left\{\begin{matrix}\text{straight}\\ \text{round}\end{matrix}\right\}$ reading, and shall record in $\left\{\begin{matrix}\text{cubic feet}\\ \text{gallons}\end{matrix}\right\}$

Old Macadam Need Not be Scrapped

(Continued from page 613)

wearing surface the completion of the pavement is the same as the surfacing of a concrete or other rigid pavement. This wearing surface should be not less than 2½ inches thick, better 3 inches, laid in two layers, one as a binder or base course, the other as the finished wearing surface.

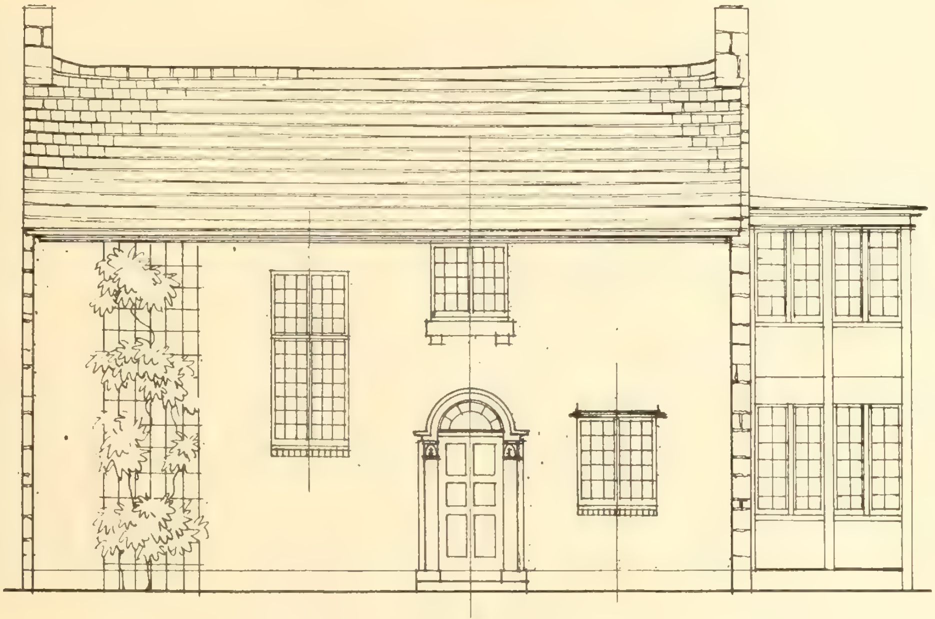
New Bridge to Form Highway Entrance Into Toronto



This is the first illustration that has been published to indicate the nature of the 1200 ft. bridge which the Ontario Department of Public Highways will build at York Mills, Ont., just north of Toronto. Yonge St., a provincial highway, will be diverted to avoid the present heavy grades at that point, in which scheme this bridge is an important element.

The Contract Record's

Weekly House Suggestion No. 72



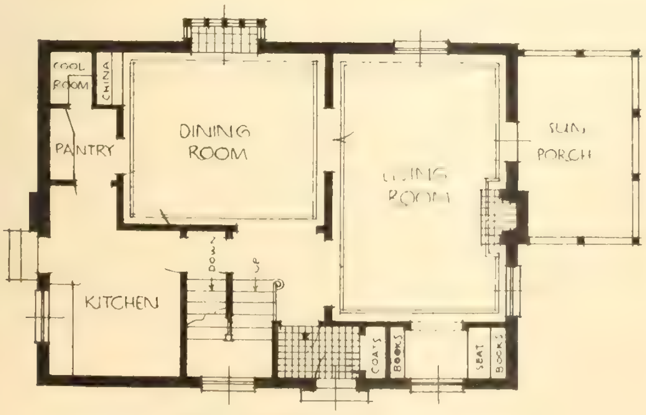
FRONT ELEVATION

The design shown in the accompanying plans is one that could be adapted to various types of construction. The front elevation is simple but pleasing and in good proportion. The small panes in the windows and the specially designed front entrance add greatly to the appearance of the house and anything simpler would hardly be suitable, as there are not many other decorative features.

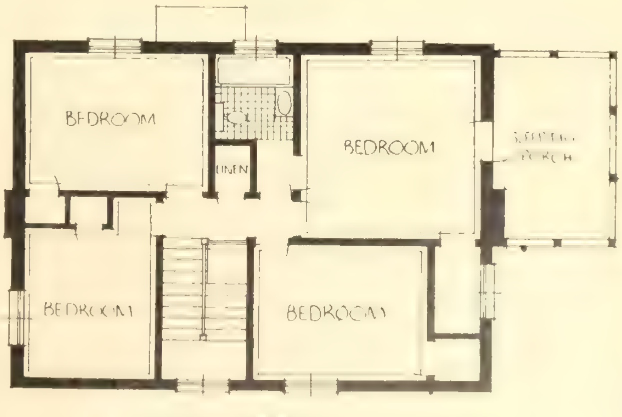
Considering the plan of the interior, a point that makes a strong appeal is the economy of hall space, permitting of the maximum floor area in the various rooms. The open quality of the halls, especially that of the lower floor, relieves the cramped feeling which a small hall conveys. The living room arrangement in this plan is an ideal one. This room is equipped with an open fireplace and other homelike features which must appeal to the home builder.

The second floor provides space for four good-sized bedrooms, conveniently laid out and well supplied with closet space.

A suggestion for the exterior finish is light grey stucco of a fine gravel aggregate, with cream coloured woodwork and a dark finish on the front door. Window sills and chimneys might be either in stone or a light reddish tone brick. The designer of this distinctive and attractive design is Mr. Morley C. Luke, architect, of Montreal West, P. Q.



GROUND FLOOR



FIRST FLOOR

Executive of A.C.B.C.I. Meets

The executive committee of the Association of Canadian Building and Construction Industries met on Wednesday June 6th at Windsor, Ontario, in the Prince Edward Hotel. Special consideration was given to the question of increasing immigration of skilled mechanics for the building and construction industry. Reports were received of the results of the recent questionnaires sent out by the Employment Service of Canada. The Association will make special representations to the Government. Progress was reported towards the working out of a practical plan of apprenticeship in the Province of Ontario. The new sales tax was discussed in its relation to various sections of the industry.

Preliminary arrangements were made for the next conference of the Association, which will be held in the Prince Edward Hotel, Windsor, Ontario, in the week commencing January 21st, 1924. There were present at the meeting Messrs, J. M. Pigott, H. J. Mero, S. E. Dinsmore, John Grieve, F. B. McFarren and J. C. Reilly.

Mainly Constructional

East and West—From Coast to Coast

The new firm of Stewart Terminals are floating a $550,000 bond issue for the financing of the construction of a large grain elevator at the head of the Great Lakes. Mr. James Stewart, president of the Maple Leaf Milling Company, of Montreal, is the president of the new concern. The elevator will have a capacity of 1,500,000 bushels.

Carpenters and laborers employed by several contractors on grain elevator construction at Port Arthur and Fort William, Ont., are asking for increased wages. Carpenters are now receiving sixty cents an hour. They want eighty-five cents. Laborers are getting thirty five and want fifty-five cents.

The B. F. Sturtevant Company, Ltd., of Galt, Ont., have commenced work on a storage building at their plant. The new building will be one-storey, 100 x 50 ft.

The Manufacturers' Life Insurance Company expect to commence the erection of a new general office building on their property on Bloor street east, Toronto, immediately opposite St. Paul's Church, early this fall. The property was acquired by the company some time ago for $215,000. There is a frontage of 300 feet on Bloor street by a depth of 600 feet and it is said the ultimate value of the building will be a million dollars. Messrs. Sproatt and Rolph are the architects.

Ten firms tendered on the contract for the stone work for the new city hall at Montreal recently, the lowest tender being for $182,000, submitted by A. & D. Boileau. The steelwork for this structure has cost $124,450. The new building will be one storey higher than the old one.

The contract for the new collegiate institute at Hamilton, Ont., was let recently to the Yates Construction Co., of that city, at $447,000. The building will contain about thirty rooms, including gymnasiums, laboratories, etc.

The plant of Consolidated Products, Ltd., manufacturers of roofing material at Quebec, P. Q., was damaged by fire recently.

Plans for the new eight-storey Lister building at Hamilton have been completed by the architect, Mr. Bernard H. Prack and tenders are being called. The new building will be located at the corner of King William and James St., with a frontage of 85 ft. on the former and 137 ft. on the latter street. It will be of reinforced concrete and terra cotta construction and will cost about $400,000, it is contemplated.

The Brantford Sand & Gravel Company have recently enlarged their plant at Brantford, Ont., bringing the capacity of their plant up to 45 cars per day, or about three times their former capacity.

The J. W. Bowser Construction Co. of Toronto, are erecting a $55,000 filtration plant at Whitby, Ont., which will cover an area of 12,000 square feet, having a holding capacity of 1,467,750 gallons per day. The reservoir when full holds 141,000 gallons which will supply the whole town of Whitby and Ontario Hospital. Thirty-six tons of reinforced steel are being used and concrete will be poured to the extent of 12,000 cubic yards. It has an intake pipe of 1,200 feet long. When completed it will be one of the finest plants of its kind in the province.

The Dominion Bridge Co., Lachine, P. Q., has been awarded the contract for steel for the $3,000,000 office building being built in Montreal by Anglin-Norcross, Ltd., for the Insurance Exchange Corp., Ltd.

Personals

Mr. E. J. Curry, plastering contractor, Toronto, has been nominated to contest seat "A" Southwest Toronto, in interests of the Liberal Party, at the forthcoming provincial elections.

Mr. D. K. MacAulay, of the Halifax building and contracting firm of Russell & MacAulay is spending several weeks in Boston, New Yory, and Philadelphia.

The architectural firm of E. & W. S. Maxwell, at Montreal, has been dissolved.

Robert Hobson, president of the Steel Company of Canada, Limited, Hamilton, left on June 7th for England, anticipating an absence of about three months.

Messrs. H. L. Trotter and C. L. Cate, of Montreal, have formed a company to be known as Trotter & Cate and will carry on the business of consulting, civil and electrical engineers, with offices at 285 Beaver Hall Hill, Montreal. Both members of the firm have been recently carrying on private practice in Montreal. Mr. Trotter is a graduate of the Kingston Military College and was for eight years connected with the consulting engineering firm of Ross & Holgate, Montreal. Mr. Cate graduated from McGill University and was connected for some time with the Foundation Company, Ltd., on Hydro-electric work. He was also employed in an engineering capacity on the preliminary planning and surveying of the Cedars Rapids development. Mr. Henry Holgate will be connected with the new firm in the capacity of associate consulting engineer.

Obituary

Mr. Ewen Mackenzie, a well known figure in contracting circles in Toronto, died recently at his home in that city. Deceased was born at Kirkfield, Ont., 72 years ago and for the past 30 years had resided at Toronto. He was a railway contractor and supervised the laying of many of the street car lines in the city of Toronto.

Trade Incorporations

Pipe Products, Ltd., with head office at Toronto, capital $1,150,000, to manufacture and deal in steel and metal pipe of every description.

CONSTRUCTIONAL ACTIVITY

Period of June 13 to June 19, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Acton, Ont.

Specifications have been prepared for the town for watermains costing $2,300. H. F. Farmer, clerk.

Brampton, Ont.

Peel county council will receive tenders for approximately 8,000 yds. of grading, until June 23. N. L. Powell, Court House, Brampton, Superintendent of Roads.

Cap de la Madeleine, Que.

Specifications for an extension to the sewer system, costing $1,000, are being prepared. Manholes and 9 in and 12 in. clay pipe will be required. Romeo Morressette, engineer.

Ford, Ont.

Ford Council will call tenders shortly for the paving of Pillette Rd. from the G. T. R. tracks to Tecumseh Rd.

Tenders will be called for six inch watermains for Pillette road, from Ottawa St. to Tecumseh road.

Fort Erie, Ont.

It is the intention of the council to spend $35,000 on waterworks. It will probably be apportioned as follows: $28,000 for pumps, force mains, storm sewers and connections with Bridgeburg sewers; $3,000 for contingencies and engineering; $4,000 for lands to be acquired. Tenders will be called as soon as the expenditure is sanctioned.

Galt, Ont.

The city intends to lay a 20 in. class B watermain across the river, a distance of 300 ft. Tenders will be received until July 3. W. H. Fairchild, clerk.

Govan, Sask.

Specifications for cement sidewalks are being prepared for the town. A. Graham, secretary-treasurer. Materials have not yet been secured.

Grand Mere, Que.

Tenders will be received until June 27 by the council for the construction of concrete sidewalks costing $6,000. Henri Oritz, manager.

Indian Head, Sask.

The council will receive tenders for a pipe line consisting of one mile of cast iron pipe eight inches in diameter. O. J. Godfrey, engineer.

Kamouraska, Que.

Town council intends to have a road gravelled at a cost of $1,600 and repairs made to a road at a cost of $1,400. The town is in the market for road machinery.

Moncton, N. B.

City Council has decided to purchase 1,500 gallons of Tarvia. J. Egington, engineer.

Montreal, Que.

It is the intention of the city to have sidewalks laid on Victoria St., Sherbrooke St. to Forest Lane south. S. Fortin, engineer.

Tenders for the construction of sidewalks on the east side of Mouseau St., at an approximate cost of $2,170, will be called by the city.

The city estimates that it will cost approximately $13,000 to pave Mouseau St. Tenders will be called shortly.

Ottawa, Ont.

The city will receive tenders for the construction of asphalt and wood block pavements on Wellington St., from Garland to Parkdale St., until June 26. The work is estimated to cost $112,000. A. F. Macallum, Commissioner of Works.

Ottawa Suburban Roads Commission has the following roadwork under consideration: Meirvale road to prescott highway; Old Richmond road, Bell's Corners to North Gower; Russell Road, Hawthorne to Ramsayville. Allan K. Hay, Thistle Bldg., Ottawa, engineer.

Quebec, Que.

Tenders are wanted by the Provincial Government for the gravelling of the Richmond-Yamaska highway in the township of Wickham, 44,885 ft. and the township of Grantham, 1,019 ft. J. L. Boulanger, Deputy Minister of Highways, until July 6.

Riverside, Ont.

Tenders for a sewage disposal plant and trunk sewers, estimated to cost $150,000, will be called by the council about June 23. R. W. Code, McGregor Bldg., Windsor, engineer. C. J. McHugh, clerk.

St. Gregorie Village, Que.

A preliminary report is being prepared for the town council for the construction of a $25,000 aqueduct. E. Courchesne, clerk.

CONTRACTS AWARDED

Burlington, Ont.

The town council has awarded the Grant Contracting Co., 50 Front St. east, Toronto, the general contract for paving Caroline St. and Ontario St.

The town council has awarded the Canadian Engineering & Contracting Co., 72 James St. north, Hamilton, the general contract for storm sewers costing $2,000.

Grant Construction Co. Ltd., Front St. east, Toronto, has been awarded the contract for paving Locust St. from Water St., to Ontario St.

Contract has been signed between McArthur Engineering & Contracting Co., Guelph, and the Burlington City Council for the paving of Locust St. from Ontario St. to Birch St., at $2.10 per sq. yd. and $1.05 per cu. yd.

W. B. Ford has been awarded the general contract for sewers for the town. The contract for sanitary sewer connections has been awarded to E. Care at $1.65 per foot.

Donnacono, Que.

Rodolphe Bertrand, Donnacona, who has been awarded a contract by the town for sidewalks costing $2,200 is in the market for crushed stone and cement

Fort Erie, Ont.

Albert D. Nie, Fort Erie, has been awarded contracts for sidewalks for the town. A. Seaton, clerk.

Guelph, Ont.

Contract for construction of about two miles of concrete sidewalks four feet wide has been awarded to Conrey & Robinson, Guelph, by the council. W. S. Nicklin, engineer.

Montreal, Que.

The city has awarded Quinlan, Robertson & Lanin Ltd., 50 Notre Dame St., the contracts for paving the following streets: Tadie St., $51,123.65; Knox St., $24,222.00; St. Charles St., $25,299; Ryde St., $23,360.50; Chomedy St., $19,815. Work will proceed at once.

A. Thezand, 585 St. Catherine St. east, has been awarded the contract for sewers on Grey Ave., Cote St. Antoine Rd. to the Northern limits.

Sicily Asphalt Paving Co., 60 St. Viateur St. east, has been awarded a paving contract by the city at $29,570. This company also has a contract for paving at $8,963.70.

Other contracts for roadwork awarded by the city are as follows: Mercer St., $21,980; Lebrun St., $20,460 and Jeanne Mance St., $15,000.50, Bernard Brault Ltd., C. P. R. yards.

Plantagent, Ont.

Contracts 1, 3, 4, 5, and 6, for the construction of roads and bridges in prescott and Russell counties have been awarded to Bissette & Carrill, Alfred, Ont. Contract 2 has been awarded to D. Daust, Alfred. Patterson & Byrnes Co., 71½ Sparks St., Ottawa engineer.

Regina, Sask.

The city has awarded Imperial Oil Co., Regina, the contract for asphalt street repairs.

Riverside, Ont.

Riverside council has awarded Pettypieces Ltd., the general contract for a pavement costing $14,000.

St. John, N. B.

The city has awarded the following contracts for pavements: Brittain St., H. O. Clark, Water St., $32,414.14; Market sq., Isaac & Saao, Prince Edward St.,

$14,040.70 Waterloo St. Department of Works, City $19,000. Contractors are in the market for concrete and granite blocks.

Sandwich, Ont.
S. P. West, Sandwich, has been awarded the general contract for a $36,000 pavement for Sandwich township.

Stellarton, N. S.
Walter Chisholm and Robert Stewart, Stellarton, will lay 24,000 lineal feet of sidewalks for the town.

Three Rivers, Que.
Donat Blanchette, 331 Laviolette St., has been awarded the general contract for 4,000 sq. yds. of concrete sidewalks by the city.

Windsor, Ont.
Contracts for paving Elsmere Ave., and Marenette Ave., from Giles Blvd. to Tecumseh road at approximately $33,500 each, have been awarded by the city to Chick Contracting Co., McDougal Ave., windsor.

Railroads, Bridges and Wharves

Fergus, Ont.
Wellington County Council, Jas. Beattie, St. Andrew's St., Fergus, Clerk, has decided to replace the Wilson bridge near Erin with a new structure.

Ottawa, Ont.
Patterson & Byrne, engineers, 71½ Sparks St., will receive tenders for a concrete bridge, to be built in Huntley township, until June 23.

Perce, Que.
The town council is in the market for cement and steel for a 90 ft. bridge. I. E. Vallee, Department of Public Works, Quebec, engineer.

St. Basil, N. B.
Tenders for the construction of the metal superstructure of Green River bridge, one span 157 ft. 6in. long, will be received until June 29 by the Provincial Government, Department of Public Works, Fredericton.

CONTRACTS AWARDED

Woodstock, N. B.
Provincial Department of Public Works has awarded the Dominion Bridge Co., Lachine, Que., the general contract for the construction of a bridge across the Meduxnekeag river, at $28,000.

Wotton, Que.
Plourde & Manseau, c/o T. Gervais, clerk of Wotton have been awarded the general contract for a concrete and iron bridge costing $8,525.

Public Buildings, Churches and Schools

Collingwood, Ont.
The building of a two room addition to a school in the east ward has been discussedby the School Board. W. Fryer, chairman.

Goderich, Ont.
A by-law authorizing the expenditure of $50,000 for a new hospital will be submitted to the ratepayers. T. Grundy, chairman of the hospital board.

Mabou, Cape Breton, N. S.
Tenders for the construction of a County Asylum costing $15,000 will be received by A. H. Mackay, warden of Inverness county, East Lake Ainslie, C. B., until June 25. J. W. Mackay, Pictou, N. S., architect.

Montreal, Que.
Sub-trades for a $35,000 church will be let by the general contractors, Fussing & Jorgensen, 6 Durocher St.

Oshawa, Ont.
Plans will be prepared by Hutton & Souter, Bank of Hamilton Building, Hamilton, for an addition to the collegiate. J. A. McGibbon, secretary.

Plans are also being prepared for Oshawa School Board for a ten room school building by Hutton & Souter, Hamilton.

Port Credit, Ont.
J. R. Ramsay, 64 Spencer Ave., Toronto, proposes to build a $30,000 Community Hall, 40 ft. x 100 ft., brick and concrete construction.

Three Rivers, Que.
The erection of another school is being considered by the School Board. C. Lafond, architect, will prepare plans for a building three storeys high, concrete foundation, stone, brick and steel structure.

Thessalon, Ont.
Tenders will be received by E. C. Bridge, secretary of the school board, until June 28, for the construction of a two storey school, 29 ft. x 92 ft., tile and brick construction.

Toronto, Ont.
Havergal Ladies College, Miss E. M. Knox, principal, has secured a site in the North Yonge St. district on which it will build a modern school. Plans will be prepared at once.

St. Andrews' College has secured a site at Aurora and intends to build a new college and residences.

A frontage of fifty feet on Simcoe St., has been purchased by the Provincial Government for the extension of the highways administration building. H. F. McNaughton, secretary, Provincial Department of Public Works, Toronto.

Bulk and separate tenders for the construction of a two storey church building, 52 ft. x 100 ft., stone and brick, will be received by Gordon & Helliwell, Confederation Life Bldg., until June 22.

H. F. McNaughton, secretary of the Public Works Department, Ontario, has given notice that he will receive tenders for the construction of a Community Hall at Ridgetown. Tenders will be received until June 23 and will not include heating, plumbing or electrical work.

Among the general contractors submitting tenders for the construction of the Waverly Road Baptist Sunday school are: E. Teagle & Son, 310 Davenport Road; Chas. W. Wood & Son, 450 Wellesley St.; Cartier & Cecil, 269 Leslie St.; Dickie Construction Co., Ryrie Bldg.; Alexander & Son 457 Church St.; E. J. C. Sewell, 169 Scarboro Rd.

CONTRACTS AWARDED

Cooksville, Ont.
Edgar S. Warn, Locust Ave., Mount Dennis, will build a $20,000 brick school for the School Board. Patton & Porter, 2 Gould St., Toronto, architects.

Fredericton, N. B.
The Provincial Department of Public Works, Fredericton, has awarded E. F. Power Construction Co., St. John, N. B., the general contract for an agricultural hall and gymnasium on the Experimental farm, at approximately $28,000.

Halifax, N. S.
Contracts for plumbing and heating for Lemarchant St., school have been awarded by the Board to Lee & Breenan, 22 Livingston St.

Contract for plumbing and heating for Oxford St. school has been awarded to Hagen & Co., 89 Hollis St., by the School Board. This company also has the plumbing and heating contracts for St. Andrew's Church hall.

H. G. Hagen & Co., 89 Hollis St., have the plumbing and heating contracts for "Chebucto" school, costing $31,000. F. E. Hull 31 Sackville St., architect.

Lefaivre, Ont.
The general contract for rebuilding a $70,000 church and sancristy for the parish has been awarded to L. J. Fauteux & Co., St. Benoit, Que.

Montreal, Que.
Contracts for the construction of Rielle St. school awarded are as follows: general contract, Jas Shearer & Co., 225 St. Patrick St., at $228,111; plumbing, heating and ventilating, J. Tweedle & Co., 163 Lagauchetiere St., at $60,484; roofing, plastering and tiling contracts will be let.

New Glasgow, N. S.
John Johnston, New Glasgow, has been awarded the general contract for a brick school costing $17,900 for the school board.

Quebec, Que.
C. N. Pardis Ltee., 51 Bouffard St., have the masonry contract for the Medicine School in connection with the Seminary of Quebec. Steel contract has been awarded to Eastern Canada Steel & Iron Works Ltd., Lesage Ave. Tenders will be called on other trades later, Bergeron & Lemay, 145 St. John St., Quebec, architects. The building will be six storeys high, fireproof construction.

Scotstown, Que.
Armand Grenier, Lake Magantic, Que., has been awarded the general contract for a two storey brick school costing $9,000. The contractor is in the market for all materials.

Sherbrooke, Que.
The School Board has awarded the contract for the High School to K. B. Jenckes, 25 Moore St., Sherbrooke, at $88,450. The building will be 110 ft. x 62 ft.; 38 ft. x 40 ft., brick, hollow tile and steel construction. H. G. James, Whiting Block, architect.

Strathroy, Ont.
The general contract for a nurses' home has been awarded by the Hospital board to D. J. McEachren & Son, Alvinston. The building will be of brick and concrete and will have three sets of plumbing.

Business Buildings and Industrial Plants

Hull, Que.
McKenzie & Co., Ottawa, may build a $35,000 factory in Hull. Nelson,

Burgess & Hazelgrove, Sparks St., are understood to be preparing plans

Maple Grove, Que.
Ernest Dickner, Beauharnois, is having plans for a $12,000 hotel, to be erected at Maple Grove, prepared by Alphonse Gendron, Beauharnois.

Montreal, Que.
Plans are being prepared by C. Davis Goodman, 14 St. John St., and tenders will be called shortly for a gymnasium costing $10,000. The building will be one storey high, 50 ft. x 75 ft., brick and concrete construction.

Plans are being prepared by D. E. Painchaud, 218 Chatham St., for an addition to the Laura Secord Candy Factory. A. A. Audet, manager.

St. John, N. B.
Ross & McDonald, 1 Belmont St., Montreal, it is reported are preparing plans for an eight or ten storey hotel.

Sault Ste. Marie, Ont.
The Great Northern Gas Co. Ltd., 497 Queen St. East, will proceed at once with the construction of a gas plant costing $332,475. R. G. Finnegan, Superintendent.

Tenders will be called shortly by Col. P. T. Rowland, 21 Summit Ave. for the construction of a brick and tile store brick, 52 ft. x 80 ft., stone foundation. Cost of the building is estimated at $15,000.

Tavistock, Ont.
John Lemp Jr., Tavistock, will have plans prepared for a $15,000 business block.

Toronto, Ont.
Toronto Transportation Commission, 35 Yonge St., has had plans drawn for alterations to buildings costing approximately $25,000. Separate tenders for roofing, marble, tile, heating, plastering, plumbing and electrical work are being received.

It is reported that a new theatre will be built on St. Clair Ave. in the vicinity of Osler Ave. The cost will be about $100,000.

H. B. Kennedy Construction Co., 115 Church St., will let contracts for roofing, heating, plumbing, wiring, etc., for a garage costing $20,000.

B. Swartz, 336 Dundas St., has prepared plans for a factory to be built on Adelaide St. near Spadina Ave. The building will be five storeys high with a basement. Structure will be 42 ft. x 140 ft., and it is expected that tenders will be called about July 15.

Tenders for the erection of a two storey factory, mill and brick construction, will be called by the Mahaffy Iron Works, 4 Trafalgar Ave. The company has purchased a site on Kendal Ave. above the railway tracks.

CONTRACTS AWARDED

Calgary, Alta.
Carter, Halls & Aldinger, 14 St., east, Calgary, have not yet purchased the material or let sub-trades for a flour mill costng $40,000.

Ford, Ont.,
Ford Motor Co., of Canada Ltd., Ford, has awarded S. E. Dinsmore Co. Ltd., McGregor Bldg., Windsor, the general contract for a power house and screen house,

Hespler, Ont.
Hespler Woodworking Co., Hespler, has awarded Walter Johnstone the contract for masonry for a twa storey factory, 60 ft. x 130 ft.

Montreal, Que.
Dominion Bridge Co. Ltd., Lachine, has the contract for steel for the extension to a grain elevator for the Harbor Commission. Other trades will be let by E. G. M. Cape & Co., 10 Cathcart St., general contractors.

The general contract for a concrete dam and paper mill at Brook Junction, Newfoundland, has been awarded by the Sir W. G. Armstrong-Whitworth & Co. Ltd., Montreal, to Wm. I. Bishop Ltd., 10 Cathcart St. The dam will be 1080 ft. long and 75 ft. high. This company will also drive 3,000 Raymond piles for the foundations of the mill.

Garth Co. Ltd., 28 Craig St., have the plumbing contract for the ten storey building being built by Anglin-Norcross Ltd., for the Insurance Exchange Corporation Ltd., Montreal. The contract for elevators has been let to Otis Fensom Elevator Co., 368 St. James St.

It is the intention of the Ogsensburg Coal & Towing Co., 134 McCord St., to have stables built costing $20,000. As soon as the city grants the permit Bonnell Bros., general contractors, 341 Guy St., will commence work.

Thompson Starrett Co. Ltd., 511 St. Catherine St., have been awarded the general contract for a $1,000,000 office building ten storeys high. Keefer Estate, Room 615 Union Bank Building, Ottawa, owners.

Ottawa, Ont.
The Dominion Reinforcing Co., Birks Bldg., has been awarded the contract for reinforcing steel for the factory being built at Rockland, Ont., for Champion Tire & Rubber Co., Birks Bldg., Ottawa.

Quebec, Que.
Canadian National Railways, Champlain Market Station, will build a corrugated iron warehouse 20 ft. x 300 ft., by day labor. A concrete roadway, 30 ft. x 450 ft., will also be laid.

St. Andrew's, Que.
The general contract for a tissue mill, capacity 5 tons a day, has been awarded by the Western Quebec Paper Mill Ltd., 511 St. Catherine St., Montreal, to Church Ross Co. Ltd., 10 Cathcare St., Montreal.

Springhill, N. S.
Colin Munro, Springhill, has the general contract for the construction of a $15,000 theatre for Miss M. Anderson, Springhill. Plumbing and heating contracts have been awarded to R. E. Fitzgerald, Springhill.

Tillsonburg, Ont.
Norfolk Shoe Co. has awarded Stephen Scott the general contract for a factory costing $25,000. Watt & Blackwell, Bano of Toronto Building, London architects.

Toronto, Ont.
W. A. Moffatt Co., 86 Don Esplanade, have the roofing contract for the addition to the Robert Simpson Co. store. Marble and tile contracts have been awarded to Italian Mosaic & Marble Co., 424 King St. West. R. C. Dancy, 57 Kendal Ave., has the plastering contract.

Wm. McGill Coal Co., 1143 Yonge St., has awarded R. G. Kirby, 539 Yonge St., the general contract for a two storey brick office building costing $10,000.

Reid & Brown, 63 Esplanade East, have the contract for steel for a $20,000 garage being built by the H. B. Kennedy Construction Co., 115 Church St.

Wynyard, Sask.
Victor Elevator Co., 335 Grain Exchange, Winnipeg, will erect an elevator of 30,000 bushels capacity at a cost of $11,000. C. E. Austin, manager.

Residences

Kitchener, Ont.
Dunker Bros., Louisa St., general contractors, will let plumbing, heating and electrical contracts for a $12,000 residence.

London, Ont.
L. H. Scandrett, 20 Craig St., has called for tenders for the construction of an $8,000 residence two storeys high, 25 ft. x 30 ft., concrete and stucco construction.

A two storey brick residence costing $11,000 will be built by W. B. Archer, 16 Erie Ave.

Montreal, Que.
J. Pardis, St. Jerome, Que., will build two residences costing $12,000. The buildings will be of concrete and frame construction, 30 ft. x 52 ft.

A residence and garage, costing $14,000, will be built by L. Bourbonnieri, 474 Delorimer Ave. Roofing, electrical, plastering, painting and brickwork contracts will be let. Materials are being purchased.

Manseau & Beaulien, 375 West Hill, will commence work shortly on a $10,000 residence and will let all sub-trades. Brick and other materials have not yet been purchased.

Sub-trades for a residence costing $11,000 will be let by Wm. Deslauriers, 254 Notre Dame de Gras Ave., builder.

G. Martineau, 1670 St. Lawrence Blvd., will let roofing, electrical, plumbing, heating, plastering and brickwork contracts for a $12,000 residence.

Pick & Shepperd, 360 Hingston Ave., will erect a residence costing $24,000. Materials for the building, which will be 25 ft. x 39 ft., concrete and brick, will be purchased by the builders.

An apartment house may be erected at Mountain and St. Catherine Sts., containing fifty suites. J. D'Arcy, 342 Peel St., interested.

G. H. Roberts, 2409 Christophe Colomb St., is excavating for two residences costing $22,000. Tenders for roofing, plastering, electrical, plumbing and heating contracts will be received by the builder.

Roofing, electrical, plastering and painting contracts for a $12,000 residence will be let by J. R. Caisse, 3680 St. Hubert St.

Montreal West, Que.
H. Millman, Ballantyne Ave., will probably award Thos. Gray Construction

(Continued on page 56)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders Wanted

Sealed tenders marked "Tenders for River Crossing" will be received by the undersigned up until noon on

Tuesday, July 3rd, 1923,

for the construction of a twenty inch water main across the Grand River at Galt.

Plans and specifications may be seen at the office of the undersigned. !

The lowest or any tender not necessarily accepted.

W. H. FAIRCHILD,
Manager, Public Utilities, Galt.
25-26

NEW INTAKE

WHITBY WATERWORKS

Contractors are invited to submit tenders for dredging trench and laying 1,000 feet of Flanged Steel Intake Pipe in Lake Ontario at Whitby. The depth of water varies from ten to twenty-two feet.

Tenders must be in Whitby before 8.00 P.M., Eastern Standard Time, on

Monday, July 16th, 1923,

Full particulars may be obtained from the engineers.

W. J. LUKE ESQ.,
Chairman Public Utility Commission,
Whitby, Ont.
F. W. THOROLD CO. LIMITED,
Consulting Engineers,
54 Admiral Road, Toronto.
25-26

Tenders for Bridges

Sealed tenders will be received by the undersigned up to

Saturday, June 30th, 1923,

for the undermentioned works:

(a) A 100 ft. through Pratt truss Highway Bridge, including abutments and concrete floor.

(b) A 72 ft. low Warren truss Highway Bridge, including concrete abutments and concrete floor.

(c) A 14 ft. concrete slab culvert.

All are situated in the vicinity of Port Davidson Station, in Wainfleet Township, in the County of Welland and Province of Ontario.

Tenders must be accompanied by a certified cheque or other satisfactory deposit payable to the Treasurer of the County of Welland for the amount of One Thousand Dollars, ($1,000.00). Deposits of unsuccessful tenderers will be returned when contracts are awarded.

The municipality reserves the right to reject any or all tenders or to waive any defects or irregularities therein.

Plans and Specifications will be furnished by the Engineers, Ross and Scott, Welland, Ont., upon receipt of a deposit of Ten Dollars ($10.00), which sum will be refunded upon return of the said plans and specifications, accompanied by a bona fide tender.

ROBERT COOPER,
County Clerk.
Welland, June 13th, 1923. 25-26

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

County of Wentworth and Hamilton and Wentworth Suburban Area Commission

Sealed tenders, addressed to the County Engineer, Court House, Hamilton, will be received up to noon on

Wednesday, June 27th, 1923,

for the construction of a one course Concrete Pavement in the Townships of Barton and Binbrook, approximately 9,500 square yards. Information to Bidders, Specifications, etc., may be obtained from the office of the County Engineer or from that of the County Clerk. The lowest or any tender not necessarily accepted.

HUGH A. LUMSDEN,
County Engineer.
JOHN E. PEART,
County Clerk.
25

DEPARTMENT OF ROADS

TENDERS

Richmond-Yamaska Highway

Tenders made on forms supplied by the Department of Roads and placed under envelopes bearing the words: "Tender," followed by the name of the interested highway and of the municipality, shall be received at the office of the Minister of Roads, in the city of Quebec, Government Building until twelve o'clock of the afternoon (Eastern Standard time), on

Friday the sixth (6) of July, 1923,

for the construction in gravelling of Richmond-Yamaska Highway in the municipalities of the townships of Wickham, length 44,885 feet and Grantham, length 1,019 feet.

The Government of the Province of Quebec does not bind itself to accept any of the tenders.
Quebec, June 14th, 1923.

J. L. BOULANGER,
Deputy Minister.
25

City of St. Lambert

Tenders for Pavement Wanted

Tenders are invited up to 5 P.M. (Daylight Saving)

Monday, June 25th, 1923,

for the laying of approximately twenty-nine thousand (29,000) square yards of Asphalt Pavement on five (5") inch Concrete Base.

Plans may be seen, specifications and form of tender had at the office of the undersigned.

The City reserves the right to reject any or all tenders.

Signed,
E. DRINKWATER,
City Engineer.
City Hall, St. Lambert, Que 25

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 10, Section C," will be received by the undersigned until eleven a.m. Standard time on

Wednesday, July 4th, 1923,

for the Excavation of approximately 40,000 cubic yards of earth and other work required in the construction of Provincial highway from Duff to Lorlie.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:—

W. M. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.; W. A. McGowan, Sec-Treas. Village of Duff, Duff, Sask.

An accepted cheque for the sum of $700.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of 3 p.m. Standard time, Wednesday, July 14th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways, Regina, Sask.
June 13th, 1923. 25

CITY OF OWEN SOUND

Tenders for Pavement

Sealed tenders, addressed to the undersigned, will be received up to 5 P.M.

Friday, June 29th, 1923,

for the construction of approximately 15,000 sq. yards of pavement with curbing and catch basins. Alternate tenders will be considered.

All necessary information may be obtained at the City Engineer's office. Envelopes should be plainly marked as to contents, and tenders accompanied by a marked cheque of 5% of the amount of the tender and the name of an approved guaranty company.

The lowest or any tender not necessarily accepted.

D. H. FLEMING,
25 City Engineer.

Tenders for Pavement

Sealed tenders marked "Tenders for Concrete Pavement" and addressed to the undersigned, will be received until 1 P.M. on

Friday, June 29th, 1923,

for about 1 mile of re-inforced concrete pavement 18' wide, Pilette Road, in the Town of Ford City.

Plans and specifications, etc., can be seen at the office of the undersigned or at the office of J. J. Newman, Windsor, Ont., the Engineer in charge.

A marked cheque for $1,000.00 must accompany all tenders.

Work to be let subject to the approval of the Dept. of Highways.

The work to be commenced upon the completion of the installation of sewers, water mains, etc., by the Town of Ford City.

The lowest or any tender not necessarily accepted.

W. P. COYLE,
25-26 Clerk, Essex County, Sandwich, Ont.

DEPARTMENT OF ROADS

TENDERS

St. Bruno-Roberval-St. Bruno and Levis-Sherbrooke Highways

Tenders made on forms supplied by the Department of Roads and placed under envelopes bearing the words: "Tender," followed by the name of the interested highway and of the municipality, shall be received at the office of the Minister of Roads, in the city of Quebec, Government Building until twelve o'clock of the afternoon (Eastern Standard time), on

Tuesday the tenth (10) of July, 1923,

for the construction in gravelling of the following highways: St-Bruno-Roberval-St-Bruno highway in the municipality of the village of Val-Jalbert, 2050 feet; and of Levis-Sherbrooke highway in the municipality of the village of Tres-St-Redempteur, 5239 feet.

The Government of the Province of Quebec does not bind itself to accept any of the tenders.

Quebec, June 18th, 1923.

J. L. BOULANGER,
25 Deputy Minister.

Township of Markham

Sealed tenders, marked and addressed to Mr. G. A. M. Davidson, clerk, Unionville, Ontario, will be received up till noon

June 30th, 1923,

for the construction of Reinforced Concrete Bridge in Concession III.

Plans and specifications may be seen at the office of the engineers, James, Proctor & Redfern, Ltd.

(Signed)
GEO. PADGETT, Reeve,
G. A. M. DAVIDSON, Clerk.
James, Proctor & Redfern Ltd., Engineers,
36 Toronto Street, Toronto. 25

Tenders Two Girder Bridges

Sealed Tenders addressed to R. H. Fortune, Tp. Clerk Ayton, will be received by the Council Tp. of Normanby up to 6 P.M. of

Monday, July 2nd, 1923,

for following:—

(a) Two Steel Girder Bridges, Span clear 32 ft., width of roadway clear 16 ft. Class "A", lattice railing, concrete floor.

(b) Abutments and floors for two bridges. Site of work Lot 30, Con. XIV, Township of Normanby.

A certified Bank Cheque for 5% of Tender payable to Tp. Treasurer shall accompany each tender.

Plans and Specifications may be seen at the offices of the Clerk or Engineer.

The lowest or any tender not necessarily accepted.

R. H. FORTUNE, Tp. Clerk, Ayton.
R. McDOWALL, C.E., Tp. Engineer, Owen Sound.
25-26

TOWNSHIP OF ETOBICOKE

TENDERS

Laying Water Main—Steel Water Tower

Sealed tenders plainly marked as to contents will be received by the undersigned until 12 o'clock noon,

July 9th, 1923,

for

(1) Laying about 1,800 lin. feet 12 inch water main, Dundas Street.
(2) Constructing steel water tower 30 feet diameter, 100 feet length to top water line.
(3) Encasing water tower (a) in brick
(b) with gunite.

A marked cheque for five per cent (5%) of tender price must accompany each tender.

The lowest or any tender not necessarily accepted.

Further information, plans, specifications may be obtained at the office of the undersigned.

R. O. WYNNE-ROBERTS & SON,
Consulting Engineers,
88 Church Street,
Toronto.
W. J. Gardhouse—Reeve.
S. Barratt—Clerk. 25

POSITION WANTED by first class, practical sheet metal worker, all branches, good draughtsman and estimator. Box 284, Contract Record, Toronto. 24-25

Tenders Wanted

Sealed tenders for all trades will be received up to

Saturday, June 30th, 1923,

for the construction of Sunday School Building, at High Park Methodist Church, Toronto.

The lowest or any tender will not necessarily be accepted.

Plans and specifications may be seen at the office of the architect.

FRANKLIN E. BELFRY,
Architect,
25 No. 2 Bloor St. W., Toronto.

Steam Shovel for Sale

70C Bucyrus, in perfect condition, only slight minor repairs needed. Can be inspected at Woodman's Point Station near St. John, N.B. Price low. Apply A. M. McDonald, Kennedy & McDonald, Antigonish, N.S. 25-27

For Sale

- 5,000 lin. feet of 2" pipe, 5,000 lin. feet of 1½" pipe in good condition, used only two months.
- I Sawyer Massey Road Grader.
- 1—50 ton bin and screen, with elevator and buckets.
- 1,000—lin. feet Blaw-Knox 6" road forms.
- 1—C. H. & E. Water Pump.
- 1—London Paver.
- 1—Buffalo-Pit Road Roller.

Box 291, Contract Record, Toronto. 25-29

Used Equipment for Sale

Six 15-ton guy and stiff leg derricks. One 9" x 10" D. D. Hoist. One 6" x 8" D. D. Hoist. Two belt hoists D. D. One 40-c. ft. Ransome mixer, one ditto 1-yard. One Smith mixer ½ yard. Assortment of concrete buckets. 6" steam centrifugal sand and water pump. 8" ditto belt driven. Upright boilers 10, 20 and 25 H.P. Locomotive boilers, portable, 60 H.P. We stock Contractors' used equipment. Send us inquiries and we will immediately advise what we can offer.

QUEBEC MACHINERY & SUPPLY CO. LIMITED,
19 Canoterie Hill,
Quebec, Que.

FOR SALE

STEEL PLATES—STRUCTURAL GRADE

1—58" x ⅜" x 8' 0" long
1—60" x ⅜" x 6' 6" "
1—60" x ⅜" x 9' 7" "
1—60" x ⅜" x 27' 0" "
1—72" x ⅜" x 8' 0" "
1—72" x ⅜" x 17' 0" "
1—48" x ⅝" x 20' 0" "
1—60" x ⅝" x 7' 9" "
1—60" x ⅝" x 32' 6" "
3—60" x ⅝" x 40' 0" "

The above List of Plates weighs about 15 tons.

This is New Stock, although rust colored from lying in our Stockyard.

In addition we have some Narrow Plates, and a quantity of Angles, Tees, Zees and Bars. Send for a complete List and Price if you are interested.

Mill deliveries are slow; here is an opportunity to secure steel quickly.

THE MARITIME BRIDGE CO. LTD.,
25 New Glasgow, N.S.

WANTED—Designer of Structural Steel and Concrete. Railway experience necessary. Box 287 Contract Record, Toronto. 24-25

Tenders for Pumps and Motors

Tenders will be received by registered post only, addressed to the Chairman, Board of Control, City Hall, Toronto, up to 12 o'clock noon,

Tuesday, July 24th, 1923,

for the following:

Contract No. [illegible] Supply and installation of two 2,880,000 Imperial Gallon Centrifugal Sewage Pumps and Motors.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and Forms of Tender may be obtained at the Works Department, Room 12, City Hall. Tenders must comply with conditions of City By-law as to deposits and sureties as set out in specifications and Forms of Tender.

The lowest or any tender not necessarily accepted.

C ALFRED MAGUIRE, (Mayor)
25 Chairman Board of Control.

Wanted to Buy

Steam Hoist—Double Drum, suitable for pile driving. State price and condition to Box 165, Chatham, Ont. 25

CONTRACTORS—Superintendent or General Foreman requires position. Life long experience. Thorough practical knowledge of Unit costs and supervision. Excellent references. Will go anywhere. Box 282, Contract Record, Toronto. 23-26

Some One Wants to Buy

The equipment or machinery that you are not using.

It may be occupying valuable space in your yard or shop, collecting dust, rust and hard knocks.

Sell it before "Depreciation" scraps it.

Use the **Tender & Proposals Department.** It helps others, let it help you.

A new Wire Welder

Electric and other welding is being developed in Great Britain for an endless variety of purposes, and in many cases it is necessary to devise special machines to carry out the work. For example, in making junctions of wires such as are used for electric cables, the plant embodies quite a number of original features. Many attempts to solve this particular problem were made before a British firm specializing in this type of work succeeded in reaching a satisfactory solution. The usual process of joining copper, brass, or iron wires is by welding or brazing. The ends of the wires have to be trimmed, fixed in contact with each other, carefully welded or brazed, and the excess of metal filed away. This operation, although frequently carried out with great rapidity by skilled workmen, takes at least a minute or two; but when an electric welding machine is used an unskilled hand—even a boy or a girl—can do the job in a few seconds. All that the operator has to do is to fix the wires in clamps and move a handle; the rest of the action is automatic, the current being switched on and then off and welding pressure exerted—all in the correct way by simple mechanical means. This machine has been adopted by a number of leading cable manufacturers in Great Britain and bids fair to become universal wherever wire welding is in demand.

Residences

(Continued from page 53)

Co., 974 Tupper St., the general contract for a $12,000 residence.

Outremont, Que.
J. P. Lefebvre, 1487 St. Hubert St., who has the general contract for an $18,000 residence, will let roofing, electrical, plumbing, heating, plastering and tiling contracts.

Quebec, Que.
Helidore Laberge, 103 St. John St., is preparing plans for a $15,000 brick residence, 30 ft. x 40 ft., brick and concrete construction.

St. John, N. B.
Materials have not yet been purchased for the construction of five dwellings costing $40,000. W. J. Fenton, Land & Building Co., Princess St., builders. The houses will be of frame construction.

John White, 106 Orange St., will erect apartments costing $14,000. The building, which will be two storeys high will be of frame construction with concrete foundations. Materials have not yet been purchased.

South Porcupine, Ont.
The Public School Board of Tisdale Township, South Porcupine, Ont., intend to build a two storey, 6 room school costing $65,000. S. H. Cederberg, Timmins, architect.

Toronto, Ont.
Mrs. M. M. Bell, Toronto, has purchased a site on Kingston Rd., Stop 18, on which she intends to build a $1,200 residence.

Mathers & Haldenby, Manning Chambers, architects, are inviting tenders for the construction of a $45,000 residence. J. E. Ganong, 57 Glen Road, owner.

The Imperial Building Construction Co., 457 Euclid Ave., will receive tenders for all trades for four residences costing $30,000.

N. A. Armstrong Co. Ltd., 7 King St. East, architects, are preparing plans for a $75,000 apartment house for G. Garfinkle, 727 Richmond St. West. The building will be 66 ft. x 90 ft., brick construction. Tenders may be called about July 1.

CONTRACTS AWARDED

Montreal, Que.
Contracts awarded on a $50,000 apartment house by L. P. Forest, 347 St. Joseph Blvd., builder, are: roofing, M. Lamarche; plumbing, H. Hogg, 830 Ontario St. East; brickwork, N. Boine; contracts will be let for tiling, plastering, painting, etc.

J. A. Gordon, 301 St. Antoine St., has the contracts for plumbing for two residences costing $25,000. P. Bebeau, 314 St. Germain St., has the plastering contracts. Other sub-trades will be let by the builders McRitchie & Black, 14a Sussex Ave., at once.

Ottawa, Ont.
Glebe Construction Co., 90 Powell Ave., have the beneral contract for an apartment house to cost $30,000. Materials have not yet been purchased.

Regina, Sask.
The general contract for a residence costing $15,000 has been awarded to G. Sherriff, 2317 Winnipeg St., Regina. The building will be two storeys high, 28 ft. x 41 ft., brick and frame construction.

Richibucto, N. B.
Senator T. J. Bourque has awarded W. Babineau, Richibucto, the general contract for a $10,000 residence.

Sarnia, Ont.
The general contract for a duplex residence, 32 ft. x 54 ft., stucco construction, has been awarded to Jas. Shanks & Son., 272 Wellington St., at approximately $18,000.

St. Lambert, Que.
Metropolitan Housing Co., 205 St. James St., has awarded the general contract for sixteen residences to H. Dufresne, 44 Mathieu St., Ville St. Laurent. Roofing, electrical, plumbing, heating and plastering will be let. This contract is for a part of the sixty-five

Power Plants Electricity and Telephones

Campbellford, Ont.
It is reported that the Hydro-electric Commission has preparations under way for the construction of a $500,000 power plant to be known as dam No. 9. Work on this structure may commence as soon as dam No. 8 is completed. Another dam proposed for Belmont Lake and a six mile canal connecting the lake with the Trent River will make ample provision for Central Ontario's power needs for several years.

Canwood, Sask.
Velbrand Rural Telephone System will receive tenders for an extension to the system until June 23. A Torrison, Canwood, clerk.

Peterborough, Ont.
The Hydro-electric commission has awarded the general contract for the new distributing station to V. C. Hayes, 219 Park St., at $31,809.

Toronto, Ont.
Toronto Electric Commissioners, Toronto, will receive tenders for the construction of an addition to the sub-station at the corner of Edwin St. and Ruskin Ave. Until June 21.

Weston, Ont.
The Bell Telephone Co. of Canada Ltd., Montreal, has had plans prepared for a telephone exchange to be built on Mill St. Tenders will be called shortly.

CONTRACTS AWARDED

Montreal, Que.
Montreal Light, Heat and Power Co., Craig St. West, have awarded contracts for a $45,000 power house as follows: General contract to W. Irving, 26 Stanley St.; steel, Phoenix Bridge and Iron Works Ltd., 83 Colborne St.; plumbing, L. E. Moulton & Co., 142 Inspector St.; electrical and heating, owners. Roofing, plastering and steel sash have not yet been let.

houses contemplated by the Metropolitan Housing Co., at a cost of $200,000.

Miscellaneous

Ford, Ont.
Imperial Oil Co., Sarnia, will erect a steel oil tank costing $10,000. All work will be done by the company.

Kincardine, Ont.
W. Butler, Kincardine, secretary of the Board of Education, will receive tenders for alterations to the plumbing of the High School, until June 23.

Ottawa, Ont.
Tenders for the construction of a steel water tower 110 ft. high will be received by the city council until June 25. W. C. Smith, engineer.

The Public School Board, Gilmour St., is considering the installation of a central heating plant. W. C. Beattie, Superintendent of Buildings..

Tenders for dredging at Lunenburg, N.S., will be received by the Dominion Government, Department of Public Works, until June 28. R. C. Desrochers, secretary.

Tenders for the construction of a breakwater at Matene, Quebec, will be received by the Dominion Government, R. C. Desrochers, secretary, Department of Public Works, until July 6. Plans and specifications may be seen at the following places: Department of Public Works, Ottawa; Office of District Engineers, Lower St. Lawrence Power Bldg., Rimouski, Que.; Post Office, Quebec; Shaughnessy Bldg., Montreal; Post Office, Matane.

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Toronto, Ont.
Tenders for a steam and hot water heating system for the Reception Hospital, Toronto, will be received by the city until June 26. C. A. Maguire, chairman of the board.

CONTRACTS AWARDED

Vancouver, B. C.
The Department of Marine and Fisheries, Ottawa, will dredge the first narrows at a cost of $175,778. R. C. Desrochers, Ottawa, secretary of the Department of Public Works.

Fires

Three Rivers, Que.
Fire damaged the elevator and coal bin of the Dominion Coal Co., W. Lambton Wharf, to the extent of $15,000. The buildings will be re-built.

Warwick, Que.
Fire destroyed a building owned by the Warwick Woolen Mills Co. estimated to be worth $200,000. Rebuilding will commence shortly.

Late News

Antigonish, N. S.
Kennedy McDonald, Antoginish, advertise a 70 C Bucyrus Steam Shovel for sale.

Ayton, Ont.
R. H. Fortune, clerk of Normany township, Ayton, will receive tenders for the erection of two steel girder bridges, 32 ft. long, 16 ft. roadway, concrete floor and also for abutments and concrete floors for two bridges. R McDowall, township engineer, Owen Sound.

Belgrave, Ont.
A. Porterfield, Belgrave, clerk of Wawanosh township, will receive tenders for the construction of a reinforced concrete bridge 27 ft. long with a 16 ft. roadway, until June 27.

Birtle, Man.
W. B. Chapman, secretary of the Birtle municipality, will receive tenders for the construction of abutments and superstructure for a 65 ft. steel and concrete bridge. Plans and specifications are at the Parliament Buildings, Winnipeg.

Gravenhurst, Ont.
Tenders for the construction of an eight-roomed Public School for the Gravenhurst School Board will be received by the secretary, E. W. Guadrie, until June 23.

Hamilton, Ont.
County of Wentworth and Hamilton and Wentworth Suburban Area Commission, Court House, Hamilton, will receive tenders for the construction of a one-course concrete pavement in the townships of Barton and Binbrook, approximately 9,500 sq. yds. Hugh A. Lumsden, county engineer.

Lotbiniere, Que.
Joseph Emile Paquin, Arthur Sicard and Octave Germain, builders, all of Montreal, have been granted a provincial charter to act as general contractors. The company which will have a capital of $20,000 will be known as Paquin & Sicard.

Montreal, Que.
A provincial charter has been granted to the Standard Brick Co. Ltd., Montreal, which will manufacture brick, terra cotta, tiles, drains and sewer pipes, and other products of the same nature. The capital is $90,000.

Owen Sound, Ont.
Sealed tenders addressed to D. H. Fleming, city engineer, for the construction of approximately 15,000 sq. yds. of pavement with curbing and catch basins will be received until June 29. Alternative tenders will be received.

Preston, Ont.
A. H. Cober, architect, Beck Block, is receiving for tenders for the construction of a physician's residence to be erected at Freeport Sanitaruim for the Waterloo County Health Association.

Quebec, Que.
The general contract for the re-building of the Basilica has been awarded to L. H. Peters, 10 Ste. Angele St., Quebec, and the contract for structural steel to the Eastern Canada Steel & Iron Works Co. Ltd., Lesage Ave., Quebec.

Rimouski, Que.
The Eastern Quebec Construction Co. has been incorporated to carry on business as builders and general contractors, dealers in lime, brick, cement and other builder's supples. Head office will be in Rimouski.

Swan River, Man.
Tenders for the Construction of eleven pile bridges in the Swan River Municipality and also a steel bridge over the

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Big Woody river will be received by A. [illegible] Reed, secretary, Swan River, until June 26. Pile driver and piles will be supplied by the municipality. Specifications may be obtained at the Parliament Buildings, Winnipeg.

Timmins, Ont.

Timmins High School Board is open to receive plans on approval for a high school containing eight rooms. The buildings will be of brick and tile construction, equipped with gymnasium, lavatories and heating plant with an auditorium on the second floor. Plans must provide for an addition of eight rooms. H. E. Montgomery, clerk.

Toronto, Ont.

Deputations from York Township Council and the British Colonial Land Securities Ltd., waited upon York County Council this week, and asked assistance with the building of a bridge over the Bathurst St., ravine, north of St. Clair Ave. The bridge is estimated to cost $140,000.

York township council has approved the expenditure of $176,352 for sixty-five sidewalk extensions and one street improvement.

Tenders will be called during the week June 25-30 for High Park Ave. Methodist Sunday School. Belfry & Wilson, 2 Bloor St. west, architects.

Tenders will be received by the city council until July 24 for the supply and installation of two 2,800,000 imperial gallon per day centrifugal sewage pumps and motors. Specifications and forms of tender may be obtained at Room 12, City Hall.

Belfry & Wilson, architects, have let the following contracts for Donlands Methodist Church: masonry, including concrete, brick and steel, E. Pool, 94 Barrington Ave. at $6,900; carpentry, Wm. Borrow, 28 Ivy Ave. at $9,407; plastering, Tom Petrie, 87 Donlands Road $2,175; plumbing and heating F. Ross, Queen St. and Dunn Ave. at $3,,100.

Unionville, Ont.

G. A. M. Davidson, Unionville, will receive tenders until June 30 for the construction of a reinforced concrete bridge in Concession 111. James, Proctor & Redfern, Toronto, engineers.

Oil Fuel for Steam

The use of oil fuel is extending rapidly in all parts of the world as a means of raising steam in both land and marine boilers. In order to obtain efficient combustion, it is essential that the oil should be reduced to the form of a very fine spray or mist. Either steam or air may be used as a syraying or "atomizing" agent, or the oil may be atomized merely by forcing it through suitable orifices under mechanical pressure. All three methods have been used by British engineers in oil-burning equipments which are now in service all over the world. The steam spray and mechanical pressure systems are those most in favor, the former on account of its simplicity and the latter where specially rapid evaporation is required. In many instanecs oil-fired installations of British design are arranged so that the boiler can be changed from coal to oil, or from oil to coal, easily and at very short notice. This is an important consideration in countries where the supplies and prices of fuels are subject to frequent variations. Also, it is a great advantage for a steamship to be able to employ whichever fuel is cheaper at its ports of call.

A Sand Library

Row after row of little glass bottles filled with sand and carefully filed away in glass covered cabinets is a part of the technical "library" at the Structural Materials Research Laboratory at Lewis institute in Chicago. It is probably the only collection of its kind in existence, and the information contained on the labels of the bottles gives an interesting insight into the part that science is playing in modern industrial undertakings.

This "sand library" was started ten years ago, and speciment have been added from time to time until there are more than 2,800 different bottles of sand in the collection. The specimens come from every state in the Union and from Canada, Cuba, Mexico and other foreign countries.

Each sample has been carefully tested, and the result of the test are kept in the file. They include the source of the specimen, the grading, silt content and the results of the colorimetric for organic impurities. In most instances mortar and concrete tests also have been made. The reasons for the test were to ascertain the suitability of the various sands for concrete and mortar work.

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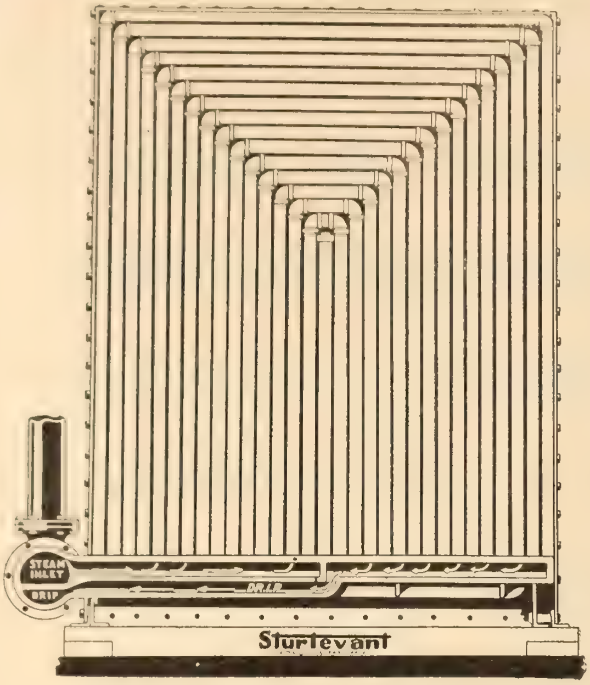

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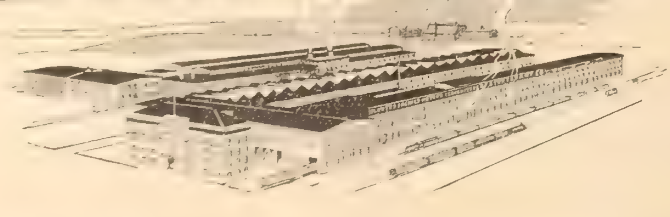

Pressure Gauge Tester

It is impossible to over-estimate the importance of accuracy in the pressure gauges used to measure the steam pressure in boilers. The stokers rely on these instruments as a guide to the firing required. As inaccurate pressure gauge must result in inefficient working of the plant and it may lead to a serious accident. Realizing the desirability of checking pressure gauges at frequent intervals, a well-known British firm has perfected a simple appliance which is inexpensive and can be used by any boiler room engneer. A small but strong cylinder is fitted with a piston exactly one-fifth of a square inch in area. The cylinder below the piston is filled with oil and the piston rod is provided with a pan or tray for the reception of weights Eeach weight is marked with the pressure which it produces in the oil and it is clear that if 50 pounds be placed on the pan a pressure of 250 lbs. per sq. inch is everted on the oil. The lower part of the cylinder is connected to a vertical pipe which has at of the gauge. An auxiliary cylinder with a screw plunger acts as an oil reservoir. The gauge to be tested is fixed to the vertical pipe, weights are placed on the pan, and the readings of the gauge are checked against the values of the weights. The whole scale of the gauge can be tested in a few minutes. The device is used extensively by British engineers, and is particularly convenient for high test pressures.

The reported acceptance by the London county council of a Belgian firm's tender for 6,900 tons of cement, because it is between $4,000 and $4,500 less than the lowest British tender, has caused considerable comment in commercial circles. The National Union of Manufacturers," said Godfrey Cheesman, its general secretary, "view the action of a great public spending body in placing a contract abroad when its requirements could undoubtedly be fulfilled at home, as a great deterrent to the solution of unemployment in this country. The London county council should set a good example, for it is the leading municipal authority, from which other councils will be tempted to take their step. One wonders whether the London county council have gone thoroughly into the consideration of the economic bearings of this matter, and satisfied themselves that the money they are saving in placing a contract abroad is really an economy to the payers of rates and taxes. We of the National Union of Manufacturers very much doubt it." The National Union of Manufacturers, Mr. Cheesman said, were urging the government to make it incumbent upon all public spending bodies to purchase only British goods. If this could be brought about it would probably solve the very difficult problem of unemployment.

Radio Station For Poland

The building of a radio station in Warsaw, which will be one of the most powerful in the world, has been undertaken with a view to giving Poland the opportunity of direct communication with western countries without having to rely upon communication through other states.

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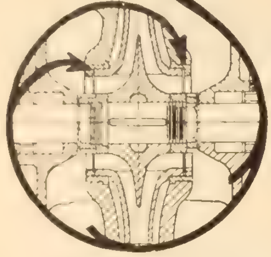

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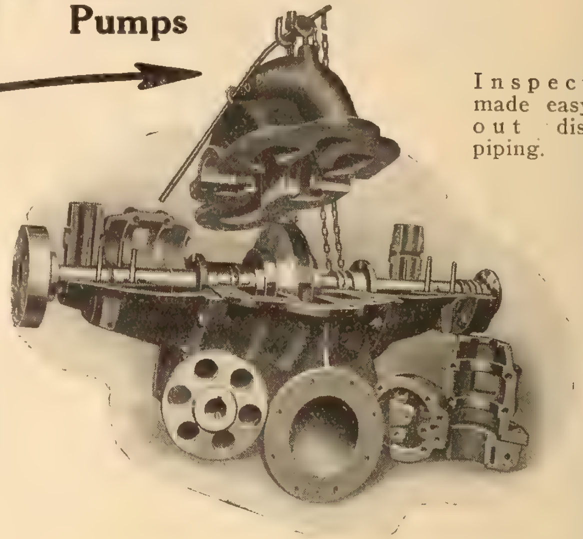

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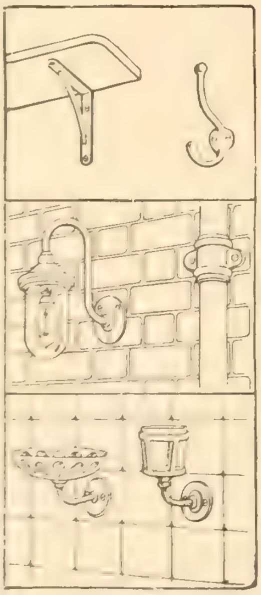

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Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.45
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	10.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	25.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*†	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	25.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M.	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00**	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base	4.00 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.00 "	5.10 base	
Hoops	per 100 lbs.	5.00 "	3.75 "		
Twisted and deformed bars	per 100 lbs.	3.90 "	4.00 "	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	4.00 "	4.00 "	5.35	6.00
Structural shapes	per 100 lbs.	3.90 "	4.25 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.15	6.25
Plates—3/16 in.	per 100 lbs.	4.40 "	4.25 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.50 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.50 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
Cast iron pipe	per ton	65.00 "	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.45	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.30	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.80.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.

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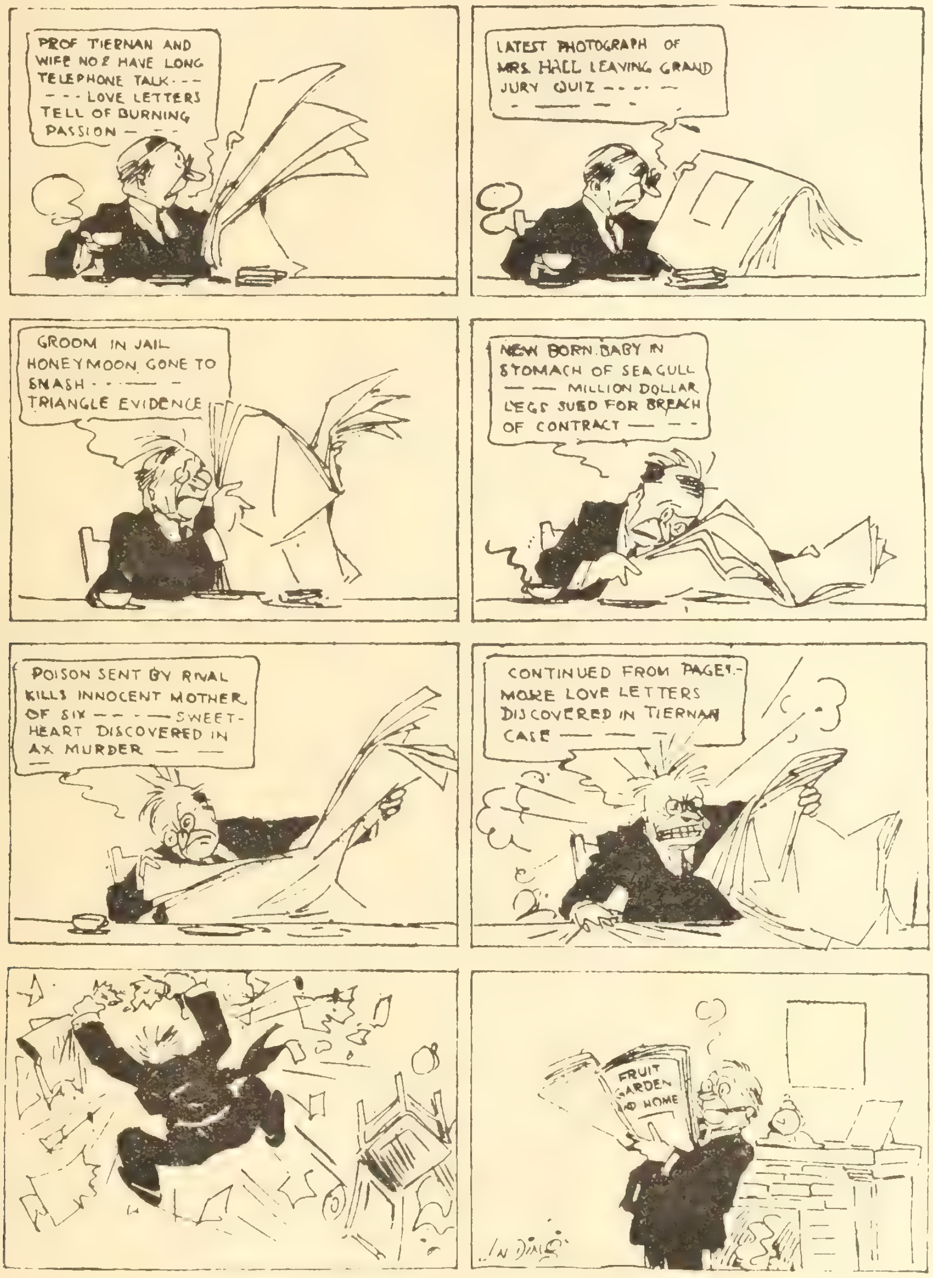
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CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS—continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	94.50	65.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	45.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	135.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	145.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.50	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	70.00
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	15.00	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	14.50
Putty in bulk	per cwt.	5.95	4.25	5.50	6.50
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.43	1.40	1.26	1.56
Raw linseed oil, in bbls.	per gal.	1.40	1.38	1.23	1.53
Turpentine, in bbls.	per gal.	1.70	2.20	2.50	2.80
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	26.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.35	1.00
Plasterers	per hr.	1.25	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers (Common)	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Laborers (Skilled)	per hr.	.60-.70			.90
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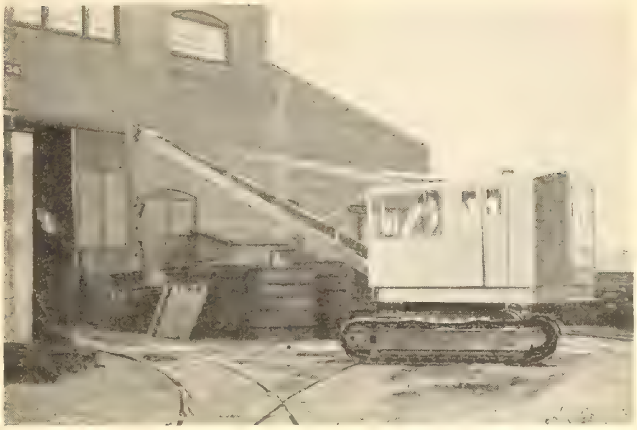

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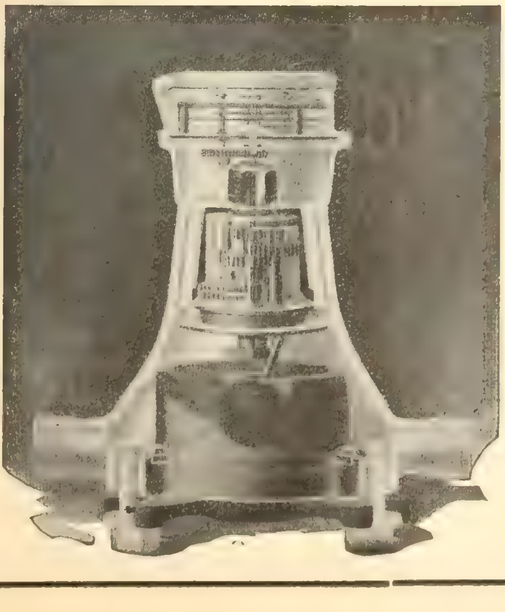

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"Handbook of Building Construction," by George A. Hool and Nathan C. Johnson. Two volumes, (not sold separately,) 1474 pages, illustrated. Published in 1920 by McGraw-Hill Book Co., Inc. Price $12.00.

"Operation and Maintenance of Irrigation Systems," by S. T. Harding. First edition, published in 1917 by the McGraw-Hill Book Co., Inc. 271 pages, illustrated. Price $2.50.

"Practical Road Building," by Charles E. Foote. Just published by David McKay, 295 pages, illustrated. Price $1.50.

"Relief from Floods." The Fundamentals of Flood Prevention, Flood Protection and the means of determining proper remedies. By John W. Alvord and Charles B. Burdock. First edition published in 1918 by McGraw-Hill Book Co., Inc. 175 pages, illustrated. Price $2.00.

"Sheet-Metal Pattern Drafting and Shop Problems," by James S. Daugherty. Published in 1922 by The Manual Arts Press, 173 pages, illustrated. Price $2.50.

"Steel Bridge Designing," by Melville B. Wells, C.E. Published by Myron C. Clark Publishing Company in 1913. 260 pages, illustrated. Price $2.00.

"The Engineering Index for 1920," recently published by the American Society of Mechanical Engineers, 586 pages, price $6.00.

"Use of Water in Irrigation," by Samuel Fortier. Published in 1915 by McGraw-Hill Book Company. 265 pages, illustrated. Price $2.00.

"Use of Water in Irrigation," by Samuel Fortier. Second edition. Published by McGraw-Hill Book Company, 1916. 325 pages, illustrated. Price $2.50.

"Water Purification," by Joseph Ellms. Published in 1917 by McGraw-Hill Book Company. 485 pages, illustrated. Price $5.00.

"Collected Papers On Acoustics," by Wallace Clement Sabine just published by the Harvard University Press. Price $4.00. 280 pages, illustrated.

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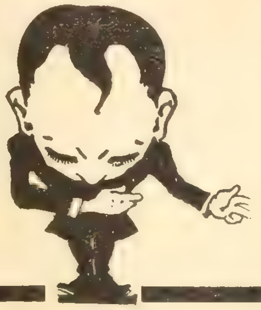

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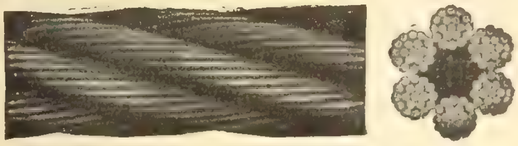

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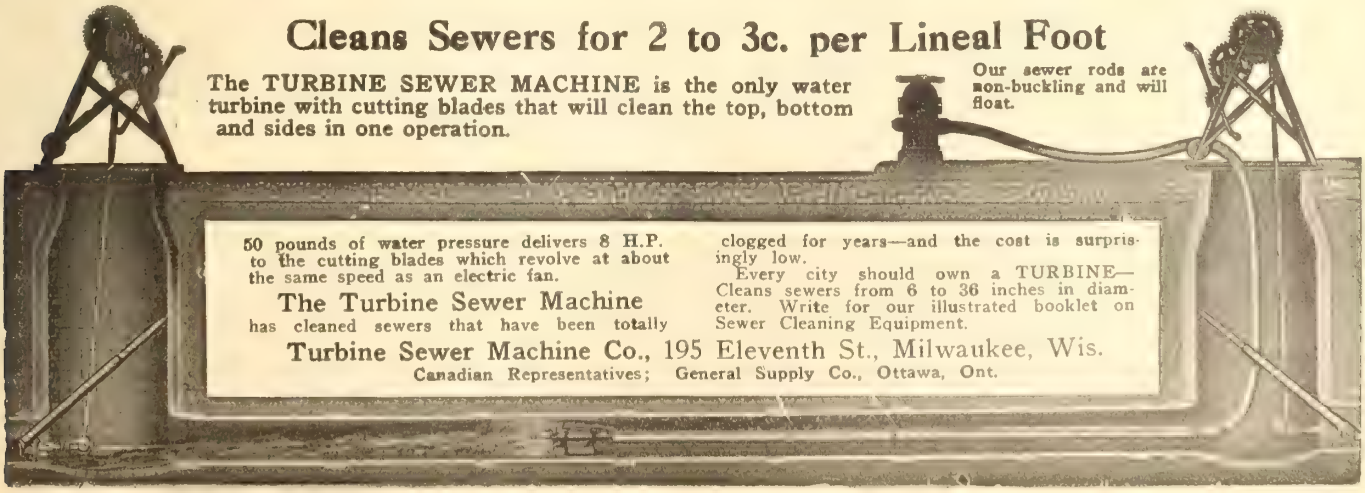

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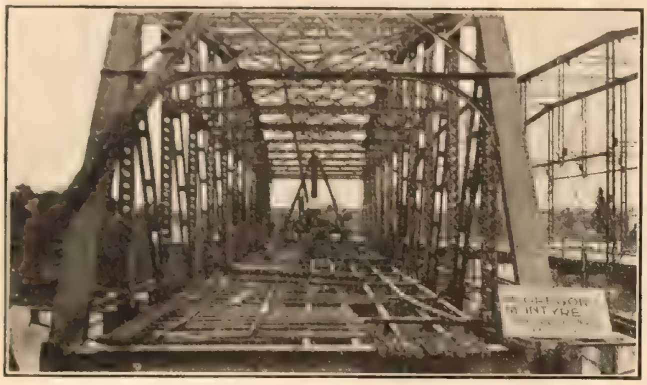

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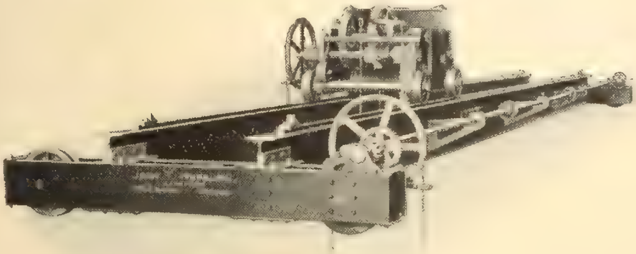

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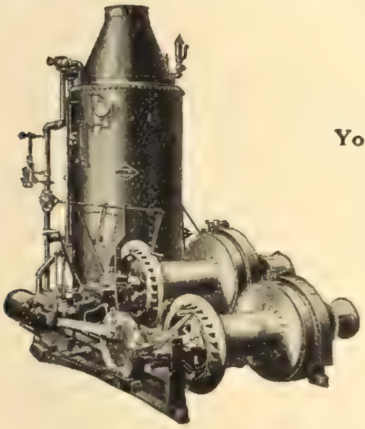

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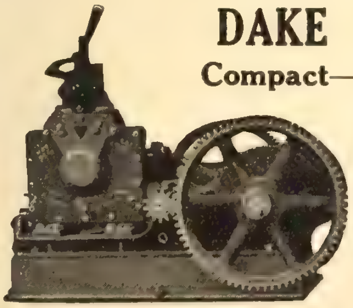

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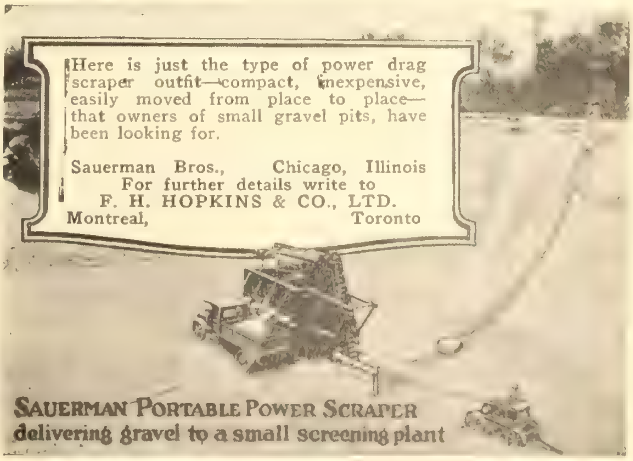

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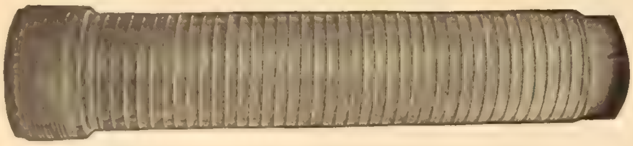

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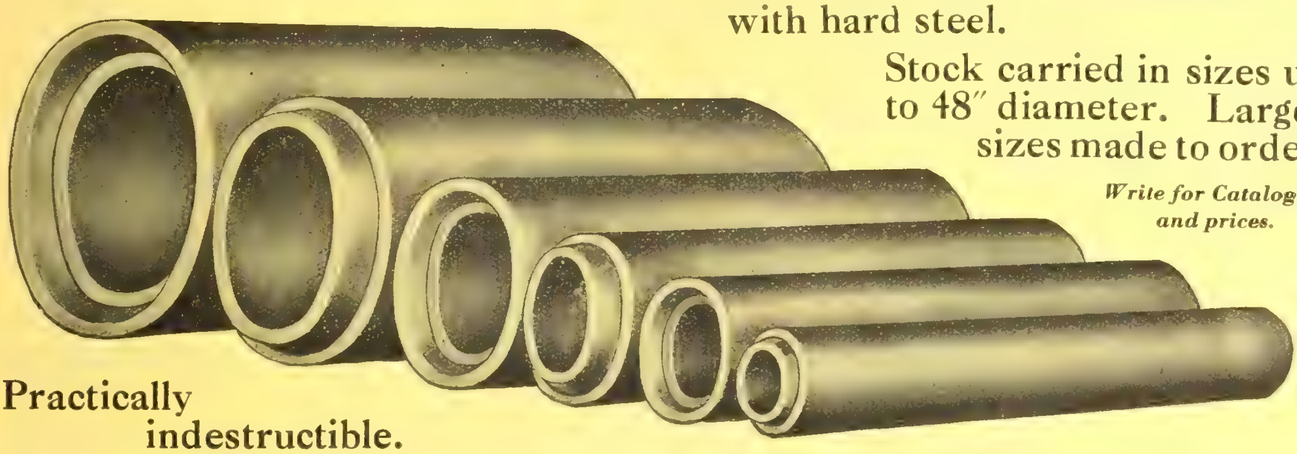

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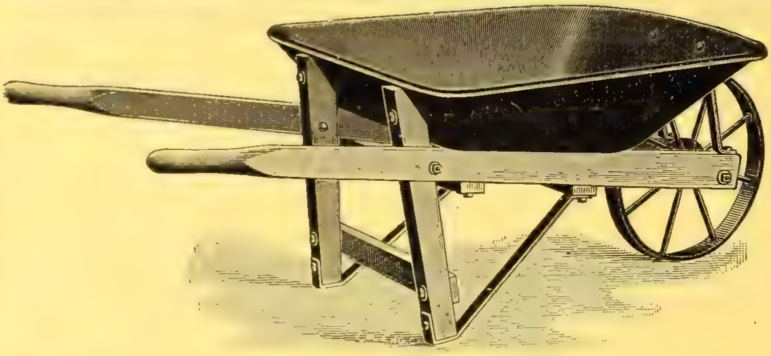

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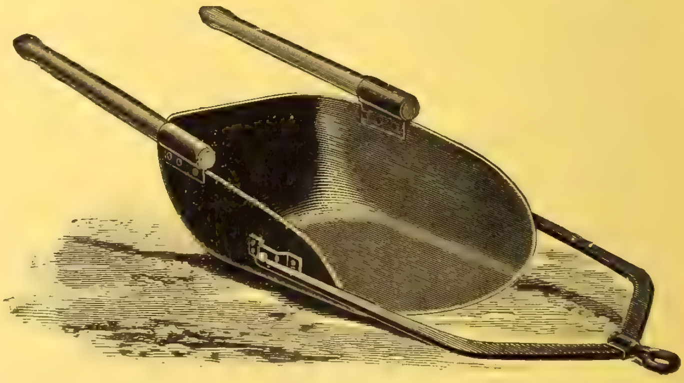

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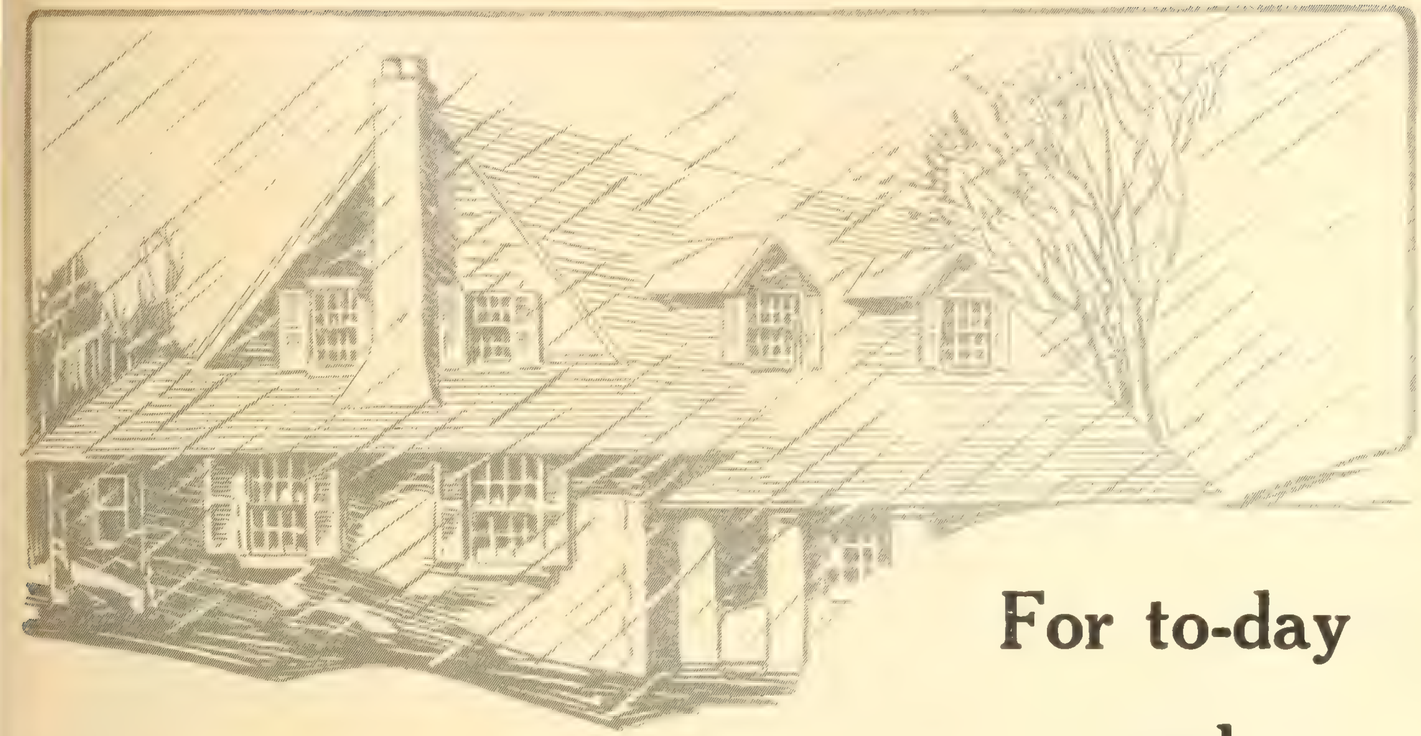

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Muldoon Ltd., J.
Oakley & Sons, Geo.
Rogers Supply Co.
Vitrified Clay Pipe Publicity Bureau

Building (Steel)
Standard Steel Construction Co.

Building Specialties
Drummond & Reeves Ltd.

Cable
Dominion Wire Rope Co., Ltd.
Greening Wire Co., B.
Mussens Limited
Standard Underground Cable Co., of Canada Ltd.

Cars—Steel Body
F. H. Hopkins & Co., Ltd.
MacKinnon Steel Company
Mussens Limited

Cars—Freight
Canadian Equipment Co.

Cars Wheels
Canada Iron Foundries

Carrier Systems
Canadian Link-Belt Co.
Jeffrey Manufacturing Co.

Castings—Grey Iron
Canada Iron Foundries
Engineering & Machine Works of Canada Ltd.
Hepburn, Ltd., John T.
H. Mueller Mfg. Co., Limited

Caulking Tools
H. Mueller Mfg. Co., Limited

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Britnell, Limited
Muldoon, Ltd., J.

Cement Gun
Cement Gun Co.
F. H. Hopkins & Co., Ltd.

Cement Hardener
Canada Cement Co.
Rogers Supply Co.
Spielman Agencies Regd.

Cement Waterproofing
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.

Centrifugal Pumps
Canadian Austin Machinery
Canadian Blower & Forge Co.
F. H. Hopkins & Co., Ltd.
London Concrete Machry. Co.

Chains
Canadian Link-Belt Co.
McKinnon Columbus Chain Co.

Chemists
Canadian Inspection & Testing Laboratories

Chimneys
Summerhays & Co., Wm.
Vitrified Clay Pipe Publicity Co., of Canada Ltd.

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Canadian Austin Machinery
F. H. Hopkins & Co., Ltd.
Orton & Steinbrenner Co.

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Canadian Equipment Co.

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Orton & Steinbrenner Co.

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Canadian Austin Machinery
Canadian Link-Belt Co.
Canadian Mead-Morrison Co.
General Products Co.
Industrial Works
Koehring Co., of Canada
Turnbull & Co., Harvard

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London Concrete Machry. Co.

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Canadian Welding Works
F. H. Hopkins & Co., Ltd.
London Concrete Machry. Co.

Concrete Culvert Pipes
Dominion Concrete Company

Concrete Machinery
Canadian Austin Machinery
F. H. Hopkins & Co., Ltd.
Koehring Co., of Canada
London Concrete Machry. Co.
Mussens Limited
Watson Jack & Co.
Wettlaufer Bros.

Concrete Mixers and Appliances
Canadian Austin Machinery
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
Mussens Limited
Turnbull & Co., Harvard
Watson Jack & Co.
Wettlaufer Bros.

Concrete Hardner
Spielman Agencies Regd.

Concrete Sewer Pipe
Dominion Concrete Company

Conduits
Canadian Johns-Manville Co.
Conduits Company, Limited
National Conduit Company
Vitrified Clay Pipe Publicity Bureau

Conduits (Wooden Pressure Creosoted
Pacific Coast Pipe Co.

Contractors
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S. E. Dinsmore
Erie Clay Products
Gore, Nasmith & Storrie
Grant Contracting Co.
Kilmer & Barber
Lumsden Engineering & Transport Co.
MacKinnon Steel Company
McArthur Engineering & Construction Co.
McAuliffe, W. J. & Co.
McLeod, Norman Ltd.
Minogue Trucking Co., Ltd.
Patterson Electric Co.
Prack, Bernard H.
Provincial Contracting Co.
Rilett Brothers
F. W. Scriven Construction Co.
Thomson Bros.

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United States Fidelity & Guaranty Company

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Fuller & Johnson Mfg. Co.
Baker Mfg. Co.
Bateman-Wilkinson
Ball Engine Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Ingersoll Rand Co.
Canadian Link-Belt Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Confederation Equipment Co.
Dake Engine Co.
Eastern Equipment Co.
Engineering & Machine Works of Canada Ltd.
Gartshore, John J.
General Products Co.
Hamilton Bridge Works Co.
F. H. Hopkins & Co., Ltd.
Hepburn, Ltd., John T.
Koehring Co., of Canada
London Concrete Machry. Co.
McGovern, T. J.
McDougall Co., Ltd.
Mussens Limited
Orton & Steinbrenner Co.
Osgood Company
Sawyer-Massey Co.
Thew Shovel Co.
Turnbull & Co., Harvard
Watson Jack & Co.
Webster & Trory

Conveying Appliances
Canadian Austin Machinery
F. H. Hopkins & Co., Ltd.
Mussens Limited
Jeffrey Manufacturing Co.

Cranes (Crawling Traction)
Industrial Works

Cranes, Travelling and Locomotive
Ball Engine Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Link-Belt Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Crane Limited
Erie Steam Shovel Co.
Hopkins & Co., Ltd., F. H.
Hepburn, Ltd., John T.
Industrial Works
Koehring Co., of Canada
Mussens Limited
Orton & Steinbrenner Co.

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Britnell, Limited
Dom. Tar & Chemical Co., Ltd.

Crushed Stone and Granite
Canada Crushed Stone
Crushed Stone, Limited
Hagersville Crushed Stone Co.
Hagersville Contracting Co.
Hagersville Quarries Ltd.
McArthur Engineering & Construction Co.
Muldoon, Ltd., J.
Queenston Quarries Co.
Rogers Supply Co.
Standard Lime Co.
Standard White Lime Co.

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Canadian Ingersoll Rand Co.
Hopkins & Co., Ltd., F. H.
Jeffrey Manufacturing Co.
London Concrete Machry. Co.
Mussens Limited
Rogers Supply Co.

Cut Stone
Oakley & Sons, Geo.
Queenston Quarries Co.

Damp Proof Coating
Barrett Company, Ltd.
Imperial Oil Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Derricks and Derrick Fittings
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Hepburn, Ltd., John T.
Hopkins & Co., Ltd., F. H.
Mussens Limited
Turnbull & Co., Harvard

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Buckeye Traction Ditcher Co.
Canadian Austin Machinery
F. H. Hopkins & Co., Ltd.
Mussens Limited

Ditching Machines
Ball Engine Co.
Buckeye Traction Ditcher Co.
Canadian Austin Machinery
Erie Steam Shovel Co.
Engineering & Machine Works of Canada Ltd.
F. H. Hopkins & Co., Ltd.
Mussens Limited

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Pannill Door Co.

Drag Line Excavators
Canadian Austin Machinery
Canadian Equipment Co.
F. H. Hopkins & Co., Ltd.
Koehring Co., of Canada
Mussens Limited
Orton & Steinbrenner Co.

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Canadian Blower & Forge Co.

Dredges
Canadian Equipment Co.
Canadian Mead-Morrison Co.
Hopkins & Co., Ltd., F. H.
Mussens Limited

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Canadian Blower & Forge Co.
Hopkins & Co., Ltd., F. H.

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Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Dust Blowers
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Dump Bodies
Dominion Truck Equipment Co
Wood Hydraulic Hoist & Body Co.

Dump Cars, Wheels, etc.
Canadian Equipment Co.
Hopkins & Co., Ltd., F. H.
MacKinnon Steel Company
Mussens Limited

Drying Apparatus
Canadian Blower & Forge Co.
Sturtevant, B F. & Co.

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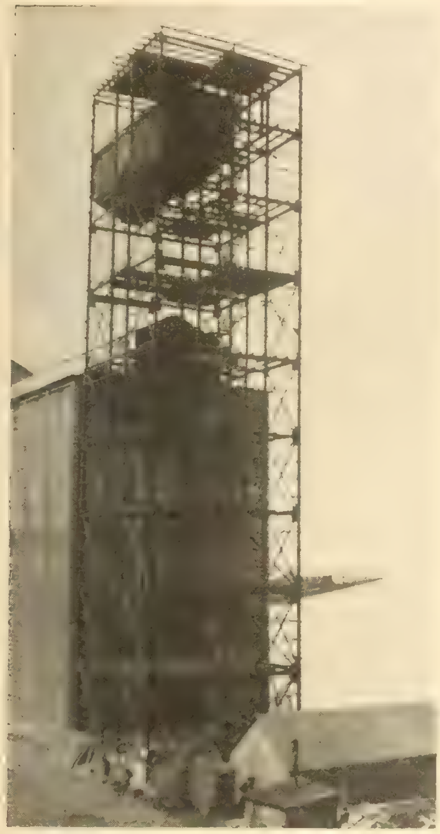


The Hamilton Bridge Works Company Limited

Head Office and Works: Hamilton, Canada

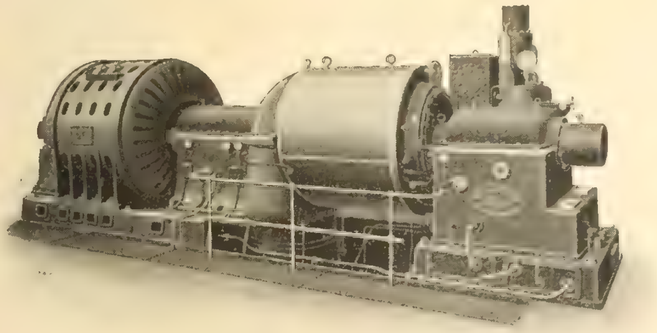
Branch Office, 410 General Assurance Bldg. Toronto, Canada

STRUCTURAL STEEL

Engineers, Manufacturers and Contractors

Steel Railway and Highway Bridges, Buildings, Girders, Crane Runways, Towers, Turntables, Trusses, Columns, Mine Buildings, Head Frames, Bins and other plate work.

We carry a large stock of Structural Shapes and plates and can make prompt shipment on orders for plain material.



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BELLISS & MORCOM LTD.

BIRMINGHAM ENGLAND

STEAM TURBINES
STEAM ENGINES
AIR COMPRESSORS
CONDENSERS
DIESEL ENGINES

RUSTON & HORNSBY

LIMITED

Lincoln — England

Road Rollers

operated by Oil Engines

Crude Oil Engines

Gas Engines

Agents—

LAURIE & LAMB, Board of Trade Bldg., MONTREAL

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Electric Fans
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Electric Water Systems
H. Mueller Mfg. Co., Limited

Electrical Specialties
Spielman Agencies Regd.

Elevator Doors
Ormsby Company, A. B.

Elevators
Canadian Link-Belt Co.
Jeffrey Manufacturing Co.
Otis-Fensom Elevator Co.
Turnbull Elevator Company

Enameled Brick
American Enameled Brick & Tile Company

Engines
Canadian Blower & Forge Co.
Canadian Ingersoll Rand Co.
Clyde Iron Works Sales Co.
Fuller & Johnson Mfg. Co.
Hopkins & Co., Ltd., F. H.
Inglis Co., John
Laurie & Lamb
Le Roy Company
Sterling Engine Co.
Waterous Engine Works Co.

Engines—Swinging
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.

Engines (Civil and Mechanical)
Chipman & Power
Hunt & Co., Robt. W.
Milton Hersey Company
Lea, R. S. & W. S.

Excavators
Ball Engine Co.
Buckeye Traction Ditcher Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Engineering & Machine Works of Canada Ltd.
Erie Steam Shovel Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
Lumsden Engineering & Contracting Co.
Mussens Limited
Thew Shovel Co.

Exhausters
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Exhaust Heads
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Fans
Jeffrey Manufacturing Co.
Canadian Blower & Forge Co.

Fans, Disc
Canadian Blower & Forge Co.
Jeffrey Manufacturing Co.
Sturtevant, B. F. & Co.

Fans, Multivane
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Fans, Propeller
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Fans, Silentvane
Sturtevant, B. F. & Co.

Filters, Water
Laurie & Lamb

Fireproofing
National Fireproofing Co.

Fireproof Doors and Windows
Fireproof Door Company, Ltd.
Mussens Limited
Ormsby Company, A. B.

Fire Escapes
Canadian Des Moines Steel Co.
McGregor & McIntyre

Fittings
Crane Limited
H. Mueller Mfg. Co., Limited
York Manufacturing Co.

Fixing Devices
Inventions Limited
Rawplug Co., of Canada

Flag Poles
MacKinnon Steel Company
McGregor & McIntyre

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Western Steel Products Limited

Floor Stands
Jenkins Bros. Ltd.

Flooring Materials
Carmichael Ltd., A. W.
Imperial Oil Company, Ltd.
National Fireproofing Co.
Vitrified Clay Pipe Publicity Bureau

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Canadian Blower & Forge Co.

Furnaces
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Orton & Steinbrenner Co.

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Hamilton Gear & Machine Co.

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McArthur Engineering & Construction Co.
Paris Sand & Gravel Co.
Rogers Supply Co.

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Eaton & Sons, J. R.

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Lumsden Engineering & Transport Co.

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Canadian Blower & Forge Co.
Crane, Limited
Sturtevant, B. F. & Co.

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Canadian Austin Machinery
Canadian Link-Belt Co.
Clyde Iron Works Sales Co.

Hoists (Truck)
Dominion Truck Equipment Co.
Wood Hydraulic Hoist & Body Co., Ltd.

Hoisting Apparatus
Canadian Austin Machinery
Canadian Ingersoll Rand Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Hopkins & Co., Ltd., F. H.
Industrial Works
London Concrete Machry. Co.
Mussens Limited
Watson Jack & Co.

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Canadian Mead-Morrison Co.
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Koehring Co., of Canada
London Concrete Machry. Co.
McGovern, T. J.
Mussens Limited
Turnbull & Co., Harvard

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Dominion Steel Products Ltd.
Kerr Engine Company
Gartshore-Thompson Pipe Co.
McAvity & Sons, T.
Hepburn, Ltd., John T.

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Melville Quarry Co.
Muldoon, Ltd., J.
Standard Lime Co.

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York Manufacturing Co.

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Canadian Austin Machinery
Canadian Equipment Co.
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MacKinnon Steel Company
Mussens Limited

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Canadian Inspection & Testing Laboratories
Hunt & Co., Robt. W.
Milton Hersey Company

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Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.
Standard Underground Cable Co., of Canada Ltd.

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Hamilton Bridge Works Co.

Joist Hangers
Hamilton Bridge Works Co.

Kilns
Canadian Blower & Forge Co.
MacKinnon Steel Company

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American Lead Pencil Co.

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Standard Lime Co.
Muldoon, Ltd., J.

Hydrated Lime
Standard White Lime Co.

Lockers (Clothes)
Canada Wire & Iron Goods Co.

Locomotive Cranes
Ball Engine Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Link-Belt Co.
Erie Steam Shovel Co.
General Products Co.
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Koehring Co., of Canada
McGovern, T. J.
Mussens Limited
Orton & Steinbrenner Co.

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Canadian Equipment Co.

Locomotive Gasoline and Storage Battery
Canadian Austin Machinery
Fate-Root-Heath Co.
F. H. Hopkins & Co., Ltd.
Jeffrey Manufacturing Co.
Koehring Co., of Canada

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Oakley & Sons, Geo.

Mechanical Rubber Goods
Jenkins Bros. Ltd.

Metal Lath
General Products Co.
Ormsby Company, A. B.

Meters
Builders Iron Foundry

Motors
Lincoln Electric Co., of Canada Ltd.
Sturtevant, B. F. & Co.

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Canadian Des Moines Steel Co.
Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
MacKinnon Steel Company

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F. H. Hopkins & Co., Ltd.
Orton & Steinbrenner Co.

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Dennis Wire & Iron Works Co.

Ornamental Moulds
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Spielman Agencies Regd.

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Hopkins & Co., Ltd., F. H.
Spielman Agencies Regd.

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Britnell, Limited
Canada Paint Co.
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
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Imperial Oil Company, Ltd.
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Greening Wire Co., B.

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Canadian Mead-Morrison Co.
Clyde Iron Works
Hopkins & Co., Ltd., F. H.
Mussens Limited

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Canada Iron Foundries
Canadian Pipe Co.
Dominion Concrete Company
Gartshore, Thompson Pipe Co.
National Iron Corporation

Pipe Covering (Cold and Steam)
Canadian Johns-Manville Co.

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H. Mueller Mfg. Co., Limited

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Dom. Tar & Chemical Co., Ltd.

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Canadian Blower & Forge Co.

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De Giorgio, Limited

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Hynes Co., W. J.

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Laurie & Lamb

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Luxfer Prism Co.

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Sturtevant, B. F. & Co.

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Canadian Mead-Morrison Co.
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H. Mueller Mfg. Co., Limited
Hopkins & Co., Ltd., F. H.
Inglis Co., John
Koehring Co., of Canada
London Concrete Machry. Co.
Mussens Limited
Waterous Engine Works Co.

Pump Valves
Jenkins Bros. Ltd.

Quarry Machinery
Hopkins & Co., Ltd., F. H.
McGovern, T. J.
Mussens Limited

Radiators (Steam Taps)
Canadian Johns-Manville Co.

Rails
Gartshore, John J.
Hopkins & Co., Ltd., F. H.
Mussens Limited

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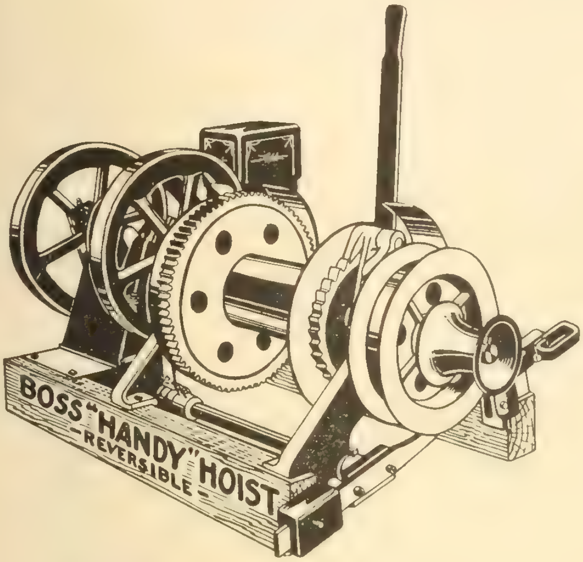
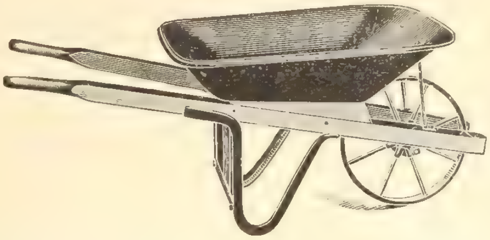


A Low Priced
REVERSIBLE "HANDY HOIST"

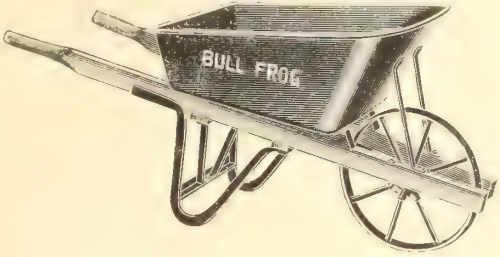
on your job will make you independent of hod carriers. Bricks, Mortar and material can be raised at an astonishingly low cost. Features—one lever controls drum operations. Powerful foot brake and ratchets. Hold load at any point. Semi-steel gears. Capacity **1300** lbs at **100 F.P.M. 700** ft. ½" cable, weight with power 1300 lbs.

A "BULLFROG" Wheelbarrow No. 22a4



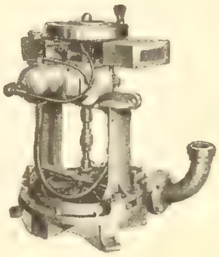
Pressed Steel Tray—
"Never Break" Wheel
—Angle iron legs and braces—two iron braces under tray—Angle iron joins front of handles, giving a solid forward dump—4 cu. ft.

BULLFROG WHEELBARROWS ARE SOLD ON QUALITY
—They Last For Years



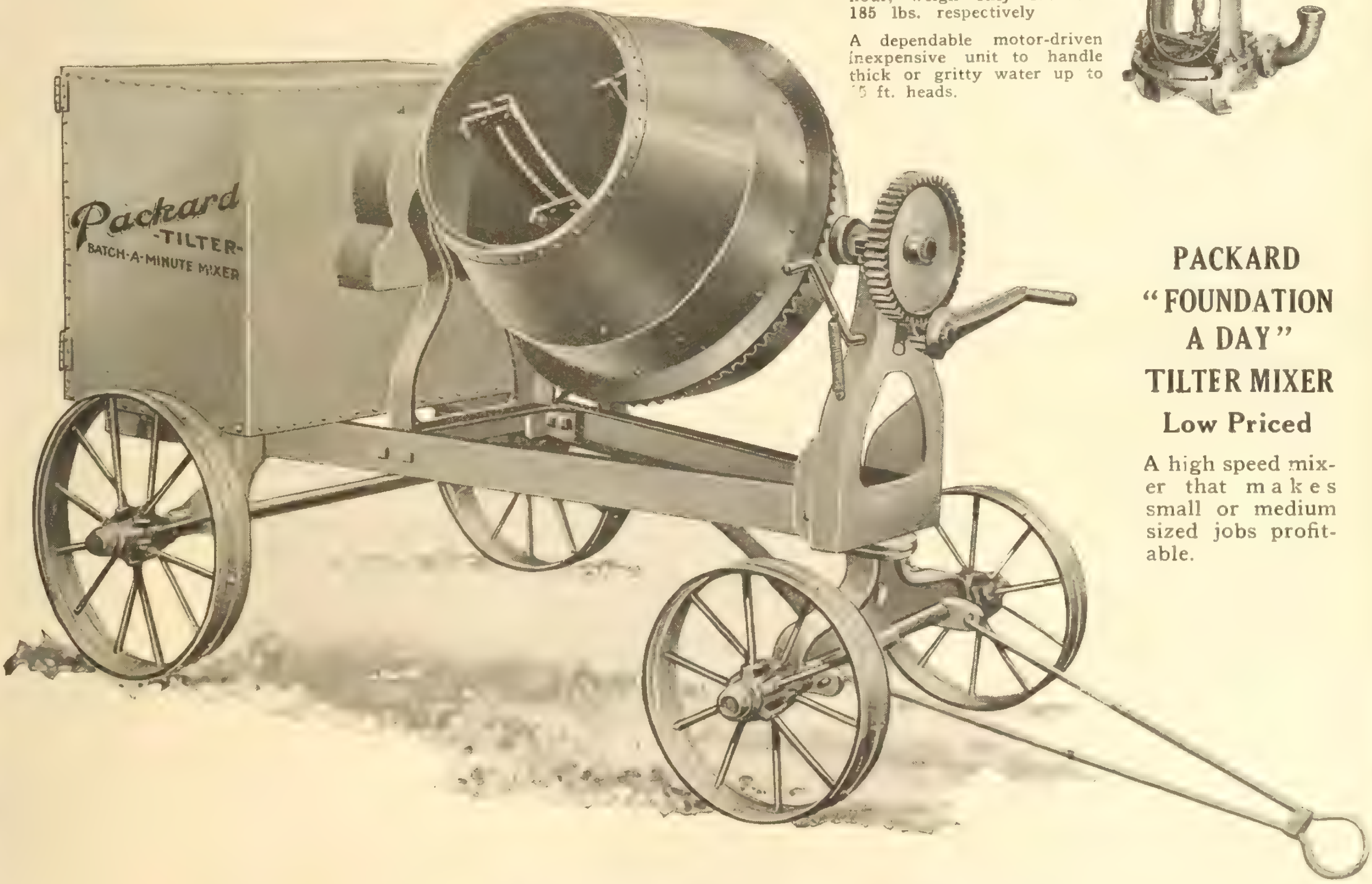
"BULLFROG"—No. 63 Mortar or Concrete Barrow "Never Break" Wheel—Angle Iron Braces—forward dump.

Evinrude Centrifugal Pump



No. **1—6800** gals. per hour. No. **1½—9000** gals. per hour, weigh only **115** and **185** lbs. respectively

A dependable motor-driven inexpensive unit to handle thick or gritty water up to 75 ft. heads.



PACKARD "FOUNDATION A DAY" TILTER MIXER
Low Priced

A high speed mixer that makes small or medium sized jobs profitable.

Our Large Stocks Mean Prompt Shipment

WATSON JACK AND COMPANY, LTD.

720 POWER BLDG. MONTREAL

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Burlington Steel Company
Canada Iron & Wire Works
Canadian Steel & Wire Co.
Greening Wire Co., B.

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Canadian Johns-Manville Co.
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MacKinnon Steel Company

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Imperial Oil Company, Ltd.

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Baker Mfg. Co.
Barford & Perkins
Canadian Austin Machinery
Can. Fairbanks-Morse Co., Ltd.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
McGovern, T. J.
Mussens Limited
Sauerman Bros.
Sawyer-Massey Co.
Waterous Engine Works Co.
Watson Jack & Co.

Road Materials
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Road Oil
Barrett Company, Ltd.
Imperial Oil Company, Ltd.

Road Tar
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Roofing Contractors
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Roofing Cement
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Roofing Material
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Brantford Roofing Co.
Canadian Johns-Manville Co.
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Vitrified Clay Pipe Publicity Bureau

Rope
Leckie Co., John

Rolling Steel Doors
Ormsby Company, A. B.

Rubble Stone
Queenston Quarries Co.

Sand
Allen Bros.
McArthur Engineering & Construction Co.
Muldoon, Ltd., J.
Paris Sand & Gravel Co.
Rogers Supply Co.
Standard Lime Co.

Saws
Canada Machinery Corporation

Screens
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Greening Wire Co., B.

Screw Plugs
Rawplug Co., of Canada
Inventions, Limited

Sewer Cleaning Machines
Turbine Sewer Machine Co.

Sewer Pipe
Britnell & Company
Muldoon, Ltd., J.
National Iron Works
Vitrified Clay Pipe Publicity Bureau

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Barrett Company, Ltd.

Shingle Stain Oil
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.

Shovels (Steam)
Ball Engine Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Mead-Morrison Co.
Erie Steam Shovel Co.
Hopkins & Co., Ltd., F. H.
McGovern, T. J.
Mussens Limited
Osgood Company
Thew Shovel Co.

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McGregor & McIntyre

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Silo Moulds
London Concrete Machry. Co.

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Canadian Blower & Forge Co.
Hamilton Bridge Works Co.
MacKinnon Steel Company
McGregor & McIntyre
Standard Steel Construction Co
Waterous Engine Works Co.

Snow Plows
Canadian Equipment Co.
F. H. Hopkins & Co., Ltd.
Mussens Limited

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Canadian Des Moines Steel Co.

Stair Builders
Canada Wire & Iron Goods Co.
Canadian Welding Works
McGregor & McIntyre

Steam Apparatus & Specialties
Canadian Blower & Forge Co.
Canadian Ingersoll Rand Co.
McAvity & Sons, Ltd., T.

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British Empire Steel Corporation
Burlington Steel Company
Hopkins, & Co. Ltd., F. H.
MacKinnon Steel Company
Nova Soctia Steel & Coal Co.
Standard Steel Construction Co.

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Burlington Steel Company
Hopkins, & Co. Ltd., F. H.
Turnbull & Co., Harvard

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Hamilton Bridge Works Co.
MacKinnon Steel Company
Toronto Steel Construction Co.

Steel Chain
Hopkins, & Co. Ltd., F. H.

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Heltzel Steel Form & Iron Co.

Steel Curb Forms
Heltzel Steel Form & Iron Co.

Steel Pipe
Canadian Des Moines Steel Co.
Horton Steel Works, Ltd.
National Equipment Company

Steel Plate Construction
Canadian Blower & Forge Co.
Canadian Des Moines Steel Co.
Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
MacKinnon Steel Company
Standard Steel Construction Co,
Sturtevant, B. F. & Co.
Waterous Engine Works Co.

Steel Road Forms
Heltzel Steel Form & Iron Co.

Steel Sash
Ormsby Company, A. B.
Can. Metal Window & Steel Products

Steel Sidewalk Forms
Heltzel Steel Form & Iron Co.

Steel Wire Rope
Canada Wire & Iron Goods Co.
Greening Wire Co., B.
F. H. Hopkins & Co., Ltd.

Stokers
Sturtevant, B. F. & Co.

Stone
De Giorgio, Limited
Britnell & Company
Oakley & Sons, Geo.
Queenston Quarries Co.
Rogers Supply Co.
Standard Lime Co.

Stove Surfacing Machinery
Canadian Ingersoll Rand Co.

Stone Working Tools
Canadian Ingersoll Rand Co.

Structural Iron and Steel
Burlington Steel Company
Canadian Des Moines Steel Co.
Hagarty, R. E. W.
Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
McGregor & McIntyre
MacKinnon Steel Company
Reid & Brown Structural Steel & Iron Works
Sarnia Bridge Company
Standard Steel Construction Co.

Swinging Gears
Clyde Iron Works
Dake Engine Co.

Tanks and Steel Pipes
Canadian Welding Works
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Hamilton Bridge Works Co.
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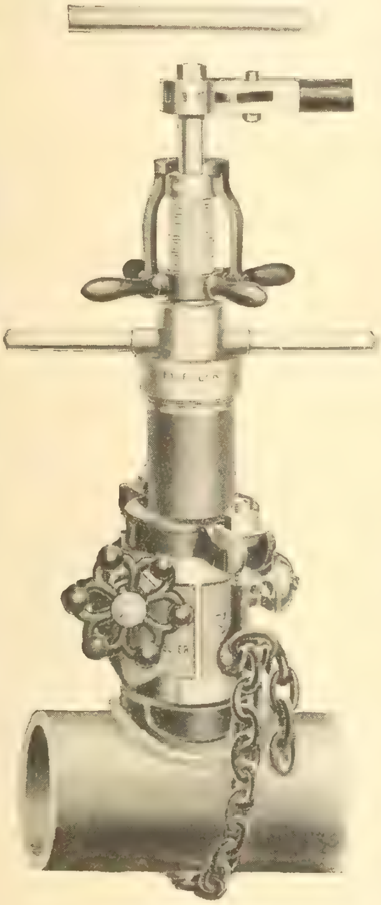
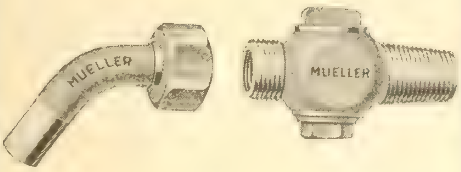
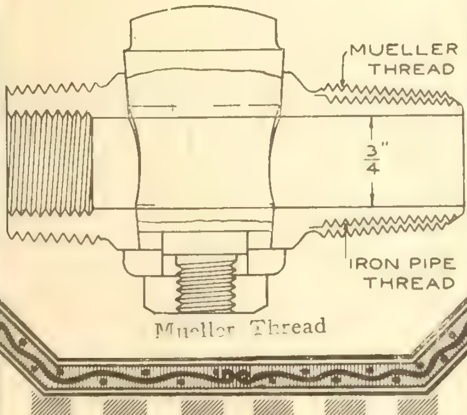


"B" Tapping Machine





Mueller Thread

Stop Time Waste in Tapping

Keep tab on your tappers time. When the job takes too much time—examine both machine and tools. You will probably find them old and worn. A small investment in new equipment will likely save much more in labor costs.

The New MUELLER *"B" Machine*

is used by the majority of the Water Works in Canada today because it lowers tapping costs and will safely tap and insert a corporation cock from ½" to 1"—and will **tap only** up to 2".

Used in connection with **Mueller** Corporation Cocks with genuine **Mueller** Thread it insures an absolutely perfect joint at the main.

Detailed descriptions and prices on request.

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Material Handling Costs a Big Factor in Determining Road Building Profits

COMPETITION is keen, labor scarce and expensive; quick delivery of material will be demanded. Are you equipped to meet the situation?

The experience of Road Contractors, Highway Engineers, Pit and Quarry and Sand and Gravel Plant owners prove that Jeffrey Labor Aiding Equipment is the equipment needed to insure the delivery of material quickly and with least possible expense and labor.

Jeffrey Equipments include:

Bucket Elevators; Chains; Sprockets; Conveyors of various types; Portable Loaders and Belt Conveyors; Pulverizers; Coal and Ashes Handling Machinery; Skip Hoists; Industrial Locomotives; etc.

Ask our Montreal Office for Catalogue and complete information

The Jeffrey Mfg. Company

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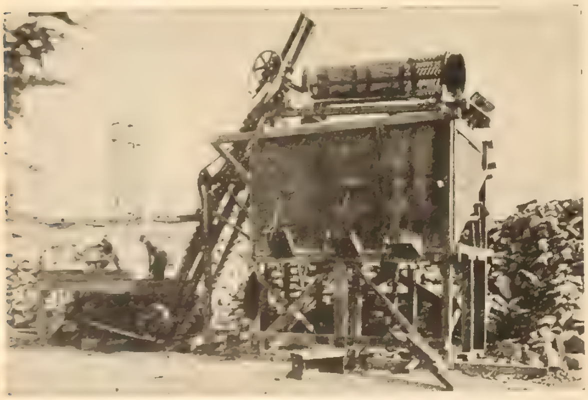
JEFFREY
MATERIAL HANDLING MACHINERY

Jeffrey Type "G" Radial Loader
[illegible] 1 to 2 cubic yards per minute of Sand, Gravel, [illegible] Stone, Coal, etc. Will dig and load hard material [illegible] the aid of shovellers or mechanical devices to bring [illegible] to the buckets. Also furnished with Tauktred base.

Portable Belt Conveyor
A light and inexpensive machine for handling loose materials —also brick, tile, packages, etc. Made in several lengths.



[illegible] Building outfit showing Jeffrey Continuous Bucket Ele-
[illegible] handling Crushed Stone from crusher to revolving screen.

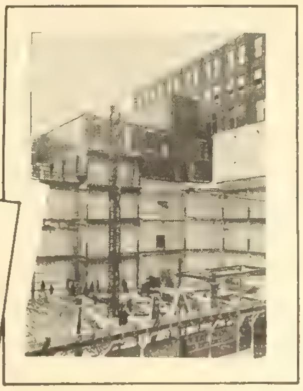
Road Contractors' Crushing Plant showing Jeffrey type "A" Swing Hammer Pulverizer for making screenings. The product of this machine meets the rigid demands of the Highway Inspector.

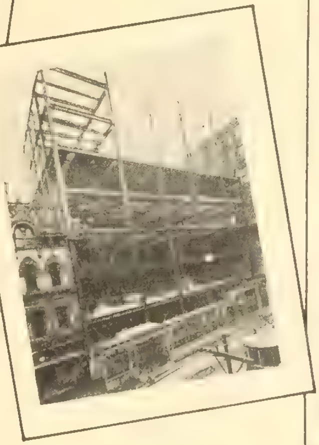
The Jeffrey 48" x 48" Type "B" Ball Bearing Swing Hammer Pulverizer. Will reduce 8" to 10" cubes of Limestone to ¾" and finer at the rate of 150 to 200 tons per hour, at very small cost for power and upkeep.

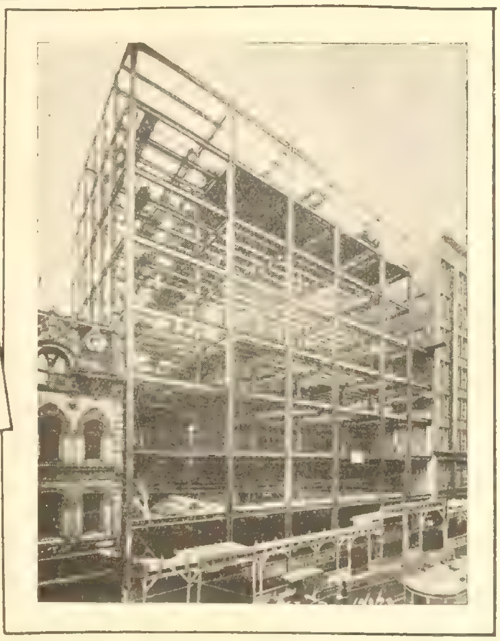
ERECTED in 17 DAYS

Framework of Structural Steel

New Building
for
THE T. EATON Co LIMITED
TORONTO - CANADA







The above illustrations indicate the erection of the steel framework of one section of the new buildings being erected for the T. Eaton Co., Limited, on Yonge Street, Toronto. This constitutes a record for the rapid erection of structural steel.

BUILD WITH
STRUCTURAL STEEL

Issued by the
Structural Steel Association

Concrete Block Building as it appeared 20 minutes after fire was lighted. Water being applied

Appearance of Concrete Block Building after fire was completely extinguished

CANADA CEMENT
CONCRETE
FOR PERMANENCE

Concrete Materials Put to a Supreme Fire Test

An interesting demonstration of fire-proof home construction was arranged by the Concrete Products Association of Minnesota.

A house was built of Concrete Block, with Cement Stucco surface, Cement Asbestos Shingles, and Concrete Sills and Lintels.

This building, filled with highly inflammable material, was set on fire, and the fire permitted to rage thirty minutes.

Although the fire was extinguished by a heavy stream of cold water applied to the intensely hot walls, close inspection of the interior disclosed the fact that not a single crack was in evidence in either the Block, or Concrete Sills and Lintels. The only parts of the building damaged at all were the Doors and Window Frames of wood.

This test, and its remarkable result, serves to emphasize the sound structural qualities of Concrete Block Stuccoed. The Concrete Block gives strength and permanence. The Stucco lends beauty and charm, in addition to being weather-proof, fire-proof and rot-proof.

When it is considered that the walls of this fire-tested dwelling were only ten days old, and the Stucco and Plaster only three days old, the results of the demonstration are truly significant.

Specify
CANADA CEMENT
Uniformly Reliable

We maintain a Service Department to co-operate in all lines of work for which Concrete is adapted. Our library is comprehensive and is at your disposal at all times without charge.

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JENKINS

Indicator Posts

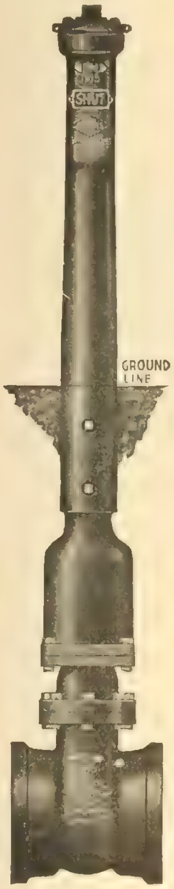
Approved by
The Fire Underwriters

The same careful designing, the same expert workmanship, the same high manufacturing standards are embodied in the making of these Jenkins Indicator Posts as in the justly famous Jenkins Diamond Marked Valves.

These Indicator Posts function satisfactorily and will stand the strain of severe usage so detrimental to inferior equipment.

When ordering be sure and specify depth of trench.

Jenkins Indicator Posts and the complete line of Jenkins Diamond marked Valves are pictured and described in Catalog No. 9—free on request.



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Always marked with the "Diamond"
Jenkins Valves
SINCE 1864

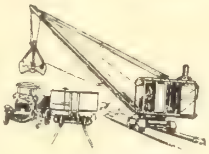
One of 3 ERIES owned by Blakeslee & Sons. Only 12 feet between curb and car track, but working without interruption to traffic.

Cutting a new subgrade through hard macadam

"We tore up the hardest macadam roadbed that I ever saw, without a repair, although we wore out the dipper teeth. And the ERIE left the road smooth and true to grade. In 2 ft. cutting we dug as high as 100 cu. yds per hour."

E. N. Clark, Supt., C. W. Blakeslee & Sons, New Haven, Conn. (Owners of 3 ERIES.)

The ERIE is the right shovel for road and street building. It cuts a smooth level subgrade, and gives big yardage even in hard material Write for Bulletin C showing just what the ERIE can do.



Any ERIE easily and quickly changed over to locomotive crane for unloading cars of stone gravel, etc.

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Inc. 1883, Formerly Ball Engine Co.
Builders of ERIE Steam Shovels and Cranes

ERIE Revolving Shovels
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- 1—40 Ton Brown Hoist Locomotive Crane, bucket operating.
- 1—Model 76 Marion Steam Shovel.
- 1—Model 20 Marion Steam Shovel.
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- 30—20 yd. Standard Gauge Ballast Cars.
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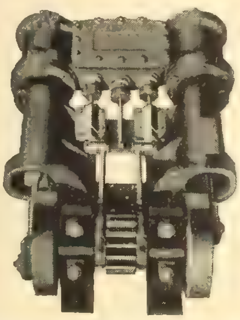


Thew Engines

JUST notice how these horizontal engines lie flat on turntable and boom. See that pinion between oversized bearings. Then observe how smoothly they run under load and what little work they make of it.

The fact that Thew engines are throttle-reversing reduces the number of moving parts, simplifies the design and makes upkeep easy. The valves are plainly marked for setting, another factor of the convenience that characterizes the Thew, as is also the hinged steel cover above the engines.

Only a few of the details, but they are important. After all, the engines are the nerve centers of the shovel, the source of its energy, and they must be right and stay right.

Successfully Handling the Hardest Jobs

DESPITE the fact that two shovels had already given this up, R. E. Carey tackled it with one of his Thews and made a good job of it.

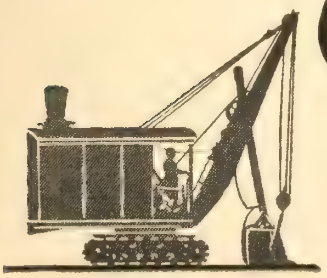
He says it's just a matter of having the equipment that can do it. He's right. 12,000 cubic yards of concrete flooring with footings and brick work is no job for any ordinary shovel to undertake.

Carey's Type 0 has been ripping out about a couple hundred yards of the stuff daily with no powder or any other means used to help it. These are the kind of jobs that demonstrate the difference between steam shovels and Thew steam shovels.

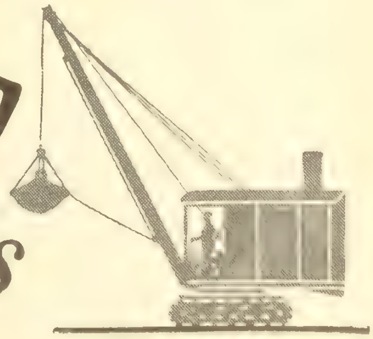
R. E. Carey owns a flock of shovels. Ask Bob what he thinks of Thews. A letter will reach him at 1500 West 112th Street, Lakewood, Ohio.

THE THEW SHOVEL CO., LORAIN, O.

THE WILSON EQUIPMENT CO., Toronto, Canada
GORMANS' LIMITED; Calgary, Edmonton, Vancouver, Canada

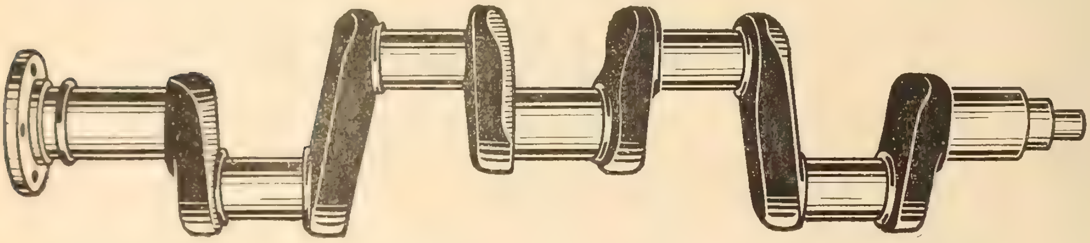


Thew
Power Shovels



Mack TRUCKS

Exclusive features



NO. 1 *The* Exclusive Crankshaft

"To give the crankshaft the rigidity it should possess, the three main journals and four crank pins measure 3 inches and 2⅜ inches respectively. These exceptional diameters throughout absolutely *prevent whipping or flexing.*

"The extra length of each journal gives the advantage of distributing the pressures over a great area, thus *reducing friction and materially increasing the life of both journals and bearings.* Both sides of each crank pin are protected against end play by extraordinary wide cheeks.

"The tendency of all crankshafts to wear oval or out of round is obviated by putting the shaft through a process of *case-hardening which imparts a glass hard outer surface, leaving the center strong and tough.*"

MACK TRUCKS OF CANADA, LTD.
28-30 Vanauley Street, Toronto, Ontario

The 27 exclusive features listed are the result of 23 years of specializing in motor transportation. Each one has played an important part in building the reputation which Mack Trucks have established wherever motor trucks are known.

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1— Crankshaft
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6— Double-Screen Oiling System
7— Water Pump
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9— Intake Manifold
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12— Reverse Gear-Shift Lever
13— Steering Wheel
14— Steering Column
15— Steel Cab Sliding Doors
16— Front Sprocket
17— Pressed Steel Radius Rod
18— Blast Cooled Dash Radiator
19— Beltless Squirrel Cage Blower
20— Single-Rod Gearshift Control
21—Non-Metallic Flexible Clutch Disc
22— Dual Reduction Drive
23— One-Piece Banjo Type Rear Axle
24— Full-Floating Construction
25— Rear Axle Accessibility
26— Drive Shaft Brake
27—Rubber (Shock Insulator) Shackles

Send for illustrated and descriptive literature on all exclusive Mack features listed above.

PUDLO

BRAND
CEMENT WATER-PROOFING POWDER

will protect your buildings, basements cellars, etc., against

Water and Damp

It is the one sure means of making all cement and concrete work permanently impermeable to water, damp and oil. It slightly strengthens concrete, and improves with age. Easy to use—no extra labor.

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Prompt Delivery

Rogers Supply Company Limited

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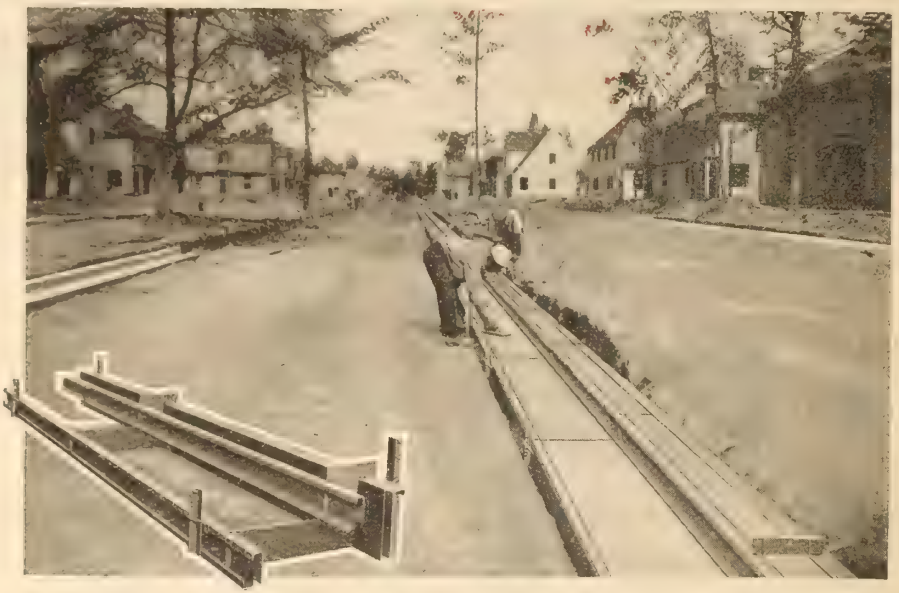

Let Us Show You How To Make More Money on Curb and Gutter Contracts

In a Youngstown job covering one mile of paving, with curb and gutter on one side only, Heltzel Steel Forms were used on the curb and gutter side of the street and wood forms on the other side.

Because of warping and cracking, very little of the wood forms were salvaged, and more than 2000 feet were used.

It took just twice as long to set the supposedly simple wood form as the Heltzel Form.

In just 19 days, the Heltzel Forms saved $58.26 in labor alone, and when the job was done the Heltzel Forms were as good as new, while practically nothing was salvaged in the wood forms.

Let us tell you the whole story of this interesting cost comparison—those facts so important to every contractor handling curb or curb and gutter contracts.

Write to-day for Form No. 34F and prices.

The Heltzel Steel Form & Iron Co.
Warren, Ohio

Manufacturers of steel forms for sidewalk, curb, curb and gutter, integral curb and base and concrete road.

Our sole Canadian Representatives:

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Made in Canada

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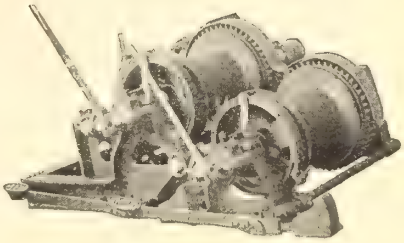

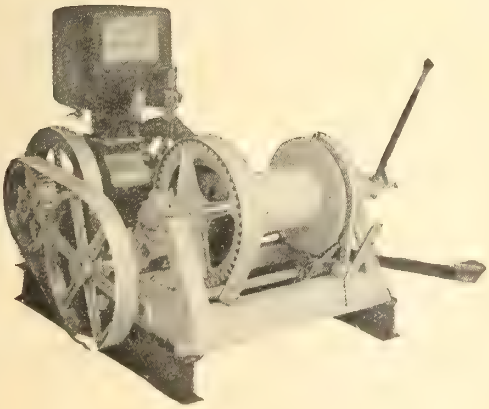

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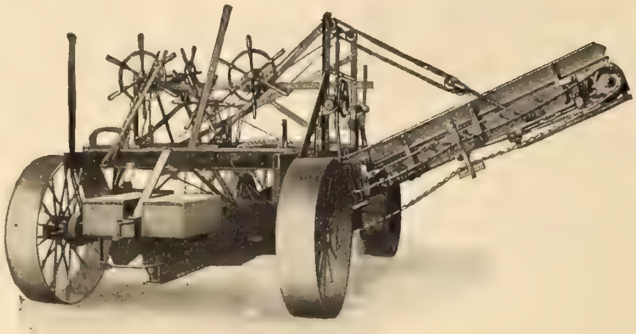

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Western machines are built to **serve**—to help the contractor do his work well, quickly and with profit to himself—and are improved from time to time to meet new problems and changing conditions. That has been good business, for service leads to sales always and inevitably. In the matter of improvement, Western machines, as one contractor expressed it, "have kept two jumps ahead of the procession."

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The 1923 Model Western Elevating Grader is the standard Western machine, still further improved and strengthened to meet new conditions and problems brought about by the growing use of heavy tractors in machine operation. Every detail of improved design before adoption was submitted to the expert judgment of a practical machine operator of long experience, familar with all makes of elevating graders. This man is confident that the 1923 Model Western corrects every weakness which is developed in existing machines.

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Catalogue No. J-57 describing and illustrating Western contractors' equipment will be sent on application.

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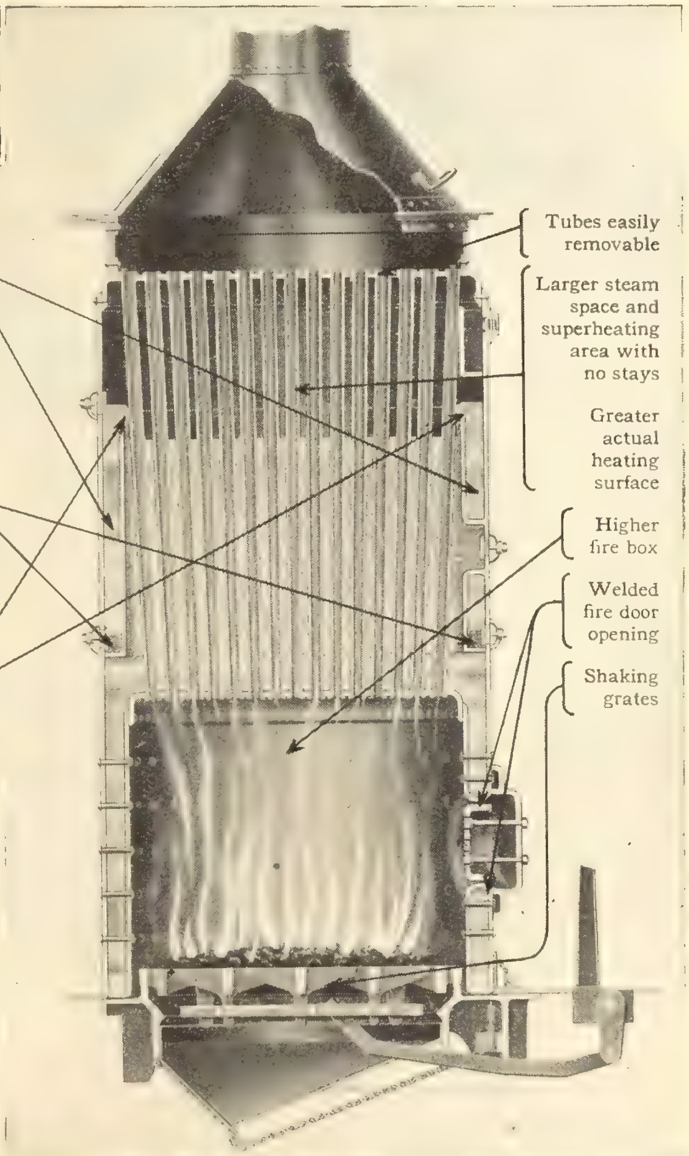
Feed water enters scale chamber where it is pre-heated . . . . here This eliminates strains caused by cold water striking hot surfaces.

With this pre-heating, impurities settle as a sludge to the bottom of the chamber . . . . here where it can readily be removed.

After this purification and pre-heating, the water flows over the scale chamber into the boiler here


Tubes easily removable
Larger steam space and superheating area with no stays
Greater actual heating surface
Higher fire box
Welded fire door opening
Shaking grates

THE SCALE CHAMBER—

Keeps tubes and sheets free from mud and scale.
Increases steaming efficiency.
Results in less crown sheet leakage.
Requires less care and attention.
Makes it possible to operate under poor water conditions with less delay and trouble.

THE SCALE CHAMBER BOILER IS FOUND ONLY ON A BUCYRUS.

Here are a few more features found only on BUCYRUS STEAM SHOVELS: Outside Dipper Sticks and Box Girder Type Boom; Swing Engines in front, NOT in rear of Shovel; Two-Part Hoist; Frameless Caterpillars with fewer parts.

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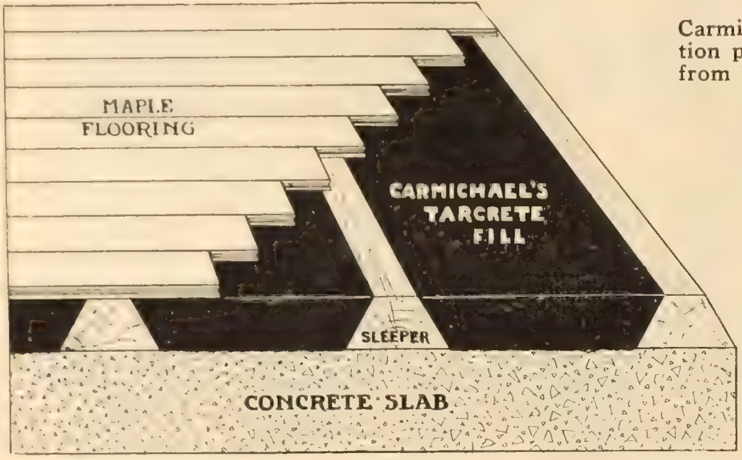
Carmichael Tarcrete Sleeper-Fill Floor Used in the T. Eaton Co.'s New Addition



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Carmichael's Tarcrete sleeper fill makes fire-proof construction possible with wooden floors by excluding all the air from below.

Carmichael's Tarcrete sleeper fill floors resist decay. They are not subject to attack from moisture and dryrot. As Carmichael's Tarcrete contains a high percentage of creosote oil, it acts as a preservative for the sleepers and floor and adds materially to the life of the floor.

Carmichael's Tarcrete sleeper fill floors are a protection against vermin and insects, such as white ants and powder-borers.

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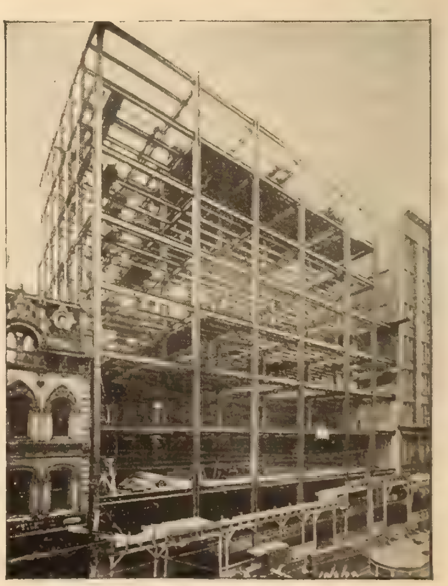
THE structural steel framework for the front portion of the ten story addition to the T. Eaton Co.'s Toronto store was completed in 17 days.



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Architects
Sproatt & Rolph

Yonge St. Store of the T. Eaton Co. Ltd.,
showing new addition

Masonry Contractors
Thomson Bros.

In choosing Don Valley Brick for facing the new addition to the T. Eaton Company's Yonge Street store, the contractors were influenced by these facts:

—"Don Valley's" known qualities of appearance and durability.
—The facilities of the manufacturers for giving service to the contractors.
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The fact that this contract was awarded to Thomson Brothers Limited, General Contractors, is a real tribute to their established ability for doing all work of this type.

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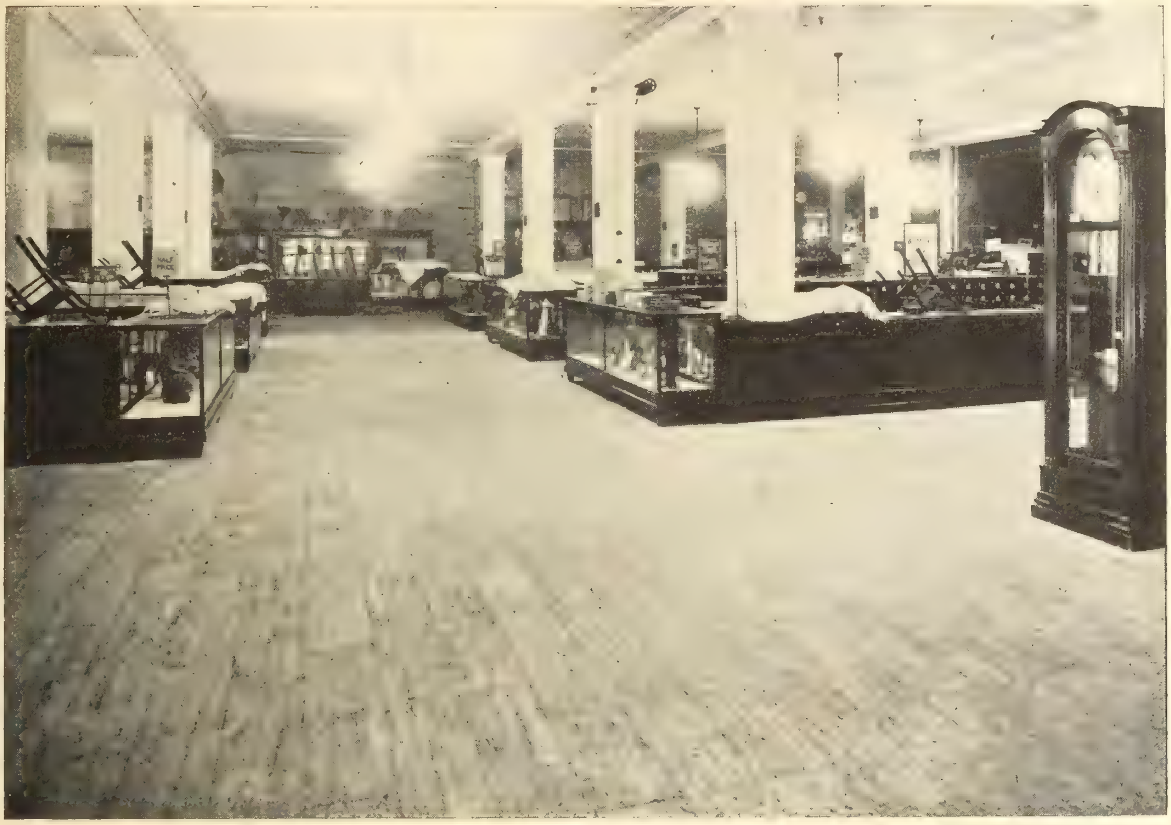
Phone Main 2453 Nights—Kenwood 6650 Lakeside 3302 *Established 1884*



Architects
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Empire's Largest Retail Store Chooses Floors of Marble

Eaton's big department store in Toronto has just been enlarged by a handsome ten-storey addition. Needless to say, everything in it represents the very last word in modern day construction.

The floors are unique, consisting of Travertine Marble Tile, mottled in color, smooth, sanitary, dustless, durable—cut and installed by George Oakley & Son, Limited, Toronto.

Predictions are already heard on all sides that this new type of floor will become a feature of the higher class building jobs of the future.

Full particulars may be promptly obtained from

Geo. Oakley & Son, Limited

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T. Eaton Company's Building, TORONTO — Geo. W. Thompson, Chief of Construction — Sproatt & Rolph, Architects

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The T. Eaton Co. Ltd.,
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Architect—Sproatt & Rolph
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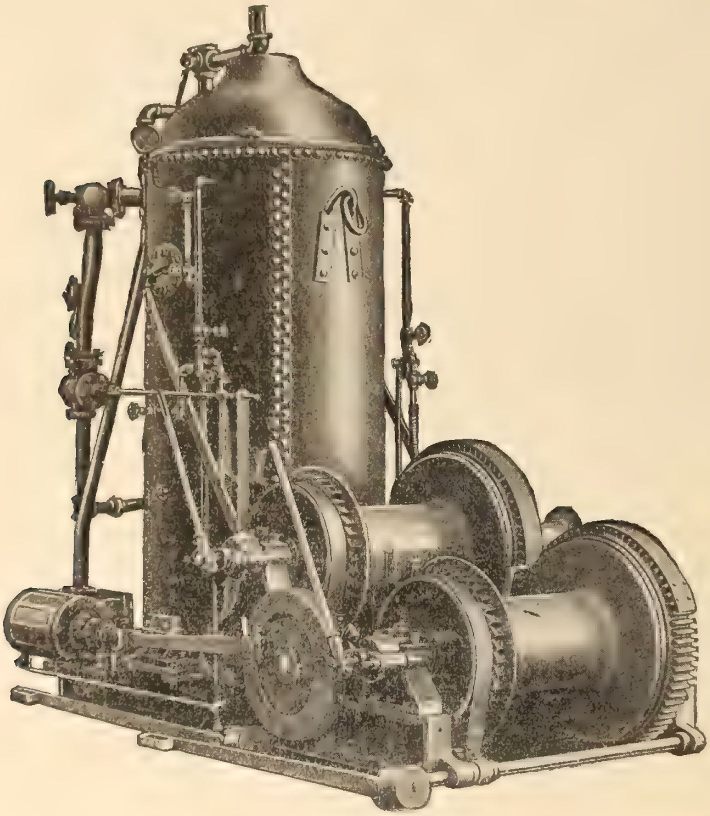

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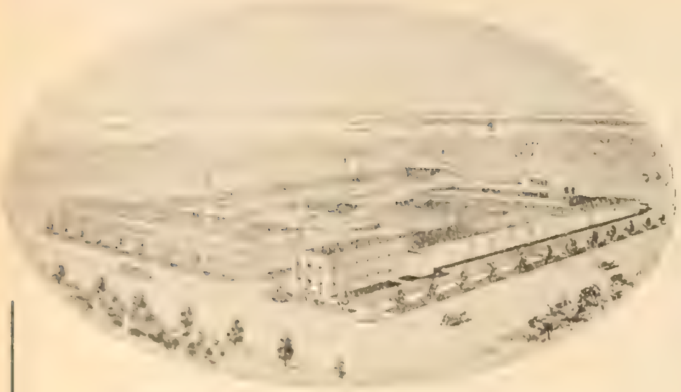

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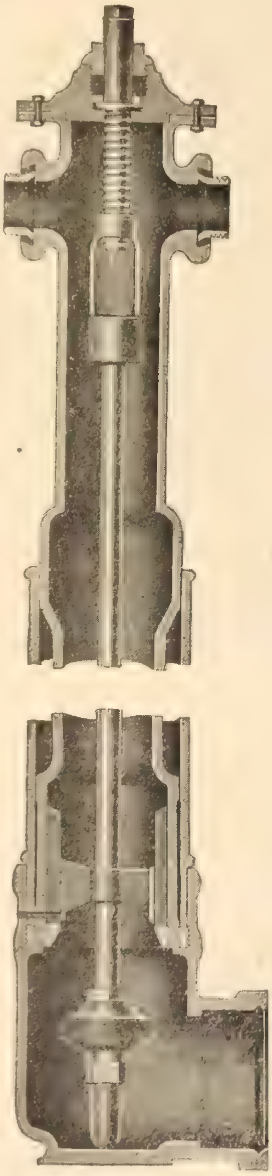

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A multiple cylinder engine with silent belt chain drive—easily portable by truck and unusually economical of operation. Write for details.

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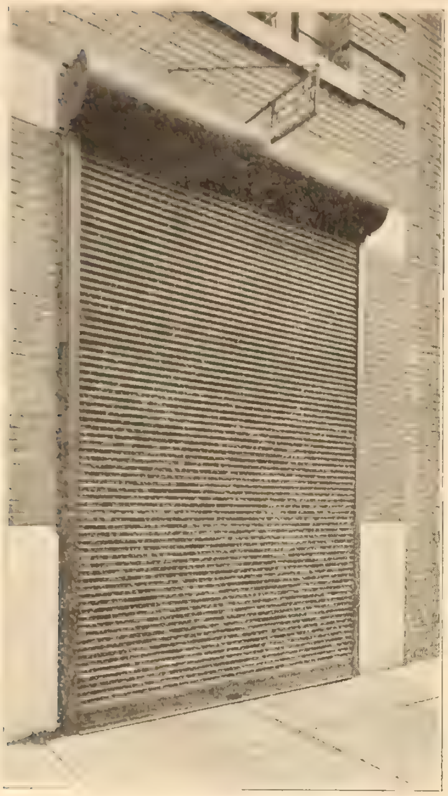

Ormsby Rolling Steel Doors

The following is an extract from a letter we have just received from Dansey & Co., New Zealand.

> "The highly favorable impression your doors have made here has been a general topic of conversation with the Engineers who have discussed the question with us, and all are agreed they are quite the finest doors ever imported into this country. The drawings supplied by you in connection with the Auckland Harbor Board's Contract, have been most favorably commented upon by the various Engineers and Government Departments. As you know engineers are inclined to judge by drawings, but in your case they have had the opportunity of inspecting the products also, and in all cases are more than satisfied."

The original of this letter is on file in our office and will be gladly shown to anyone interested.

Ormsby Products will give equal satisfaction in any and every country.

The A. B. Ormsby Company Limited, Toronto, Ont.

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Vol. 37 Toronto, June 27, 1923 No. 26

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The Standardization of Concrete Mixers

A co-operative movement on the part of equipment manufacturers and contractors, assisted by mechanical engineers, resulted in the formation, last fall, of what is called the Joint Conference of Equipment Manufacturers and the Associated General Contractors of America. This conference decided to investigate the possibility of standardizing various lines of equipment, and for the purpose of initiating discussion with the various groups of manufacturers, appointed a standardization steering committee.

The steering committee, consisting of contractors and engineers, met with a number of concrete mixer manufacturers at Cleveland, May 21, 1923, and after an extended discussion, it was unanimously agreed that the question of standardizing mixers should be submitted to the manufacturers in that line of production.

It was recommended that the entire standardization procedure be tied in officially with the American Engineering Standards Committee, and that all mixer manufacturers be invited to attend a meeting for the purpose of making recommendations and, if possible, starting the work. This meeting will, in all probability, be held in Chicago within the next month.

This is a movement that has a very commendable purpose and it is to be hoped that through the efforts of the committee and the manufacturers some definite start will be made toward the standardization of concrete mixers. Every contractor knows that some measure of standardization of equipment is advisable. His own experience has indicated lines along which it would be desirable to proceed in this connection and undoubtedly he has frequently hoped for some movement directed toward minimizing the vast array of sizes and types of construction machinery that are now on the market. It looks as if something will be done with concrete mixers as a start. Then, when some measure of standardization has been attained in that direction, other lines of equipment can be investigated with the same object in view.

Stability in the Construction Industry

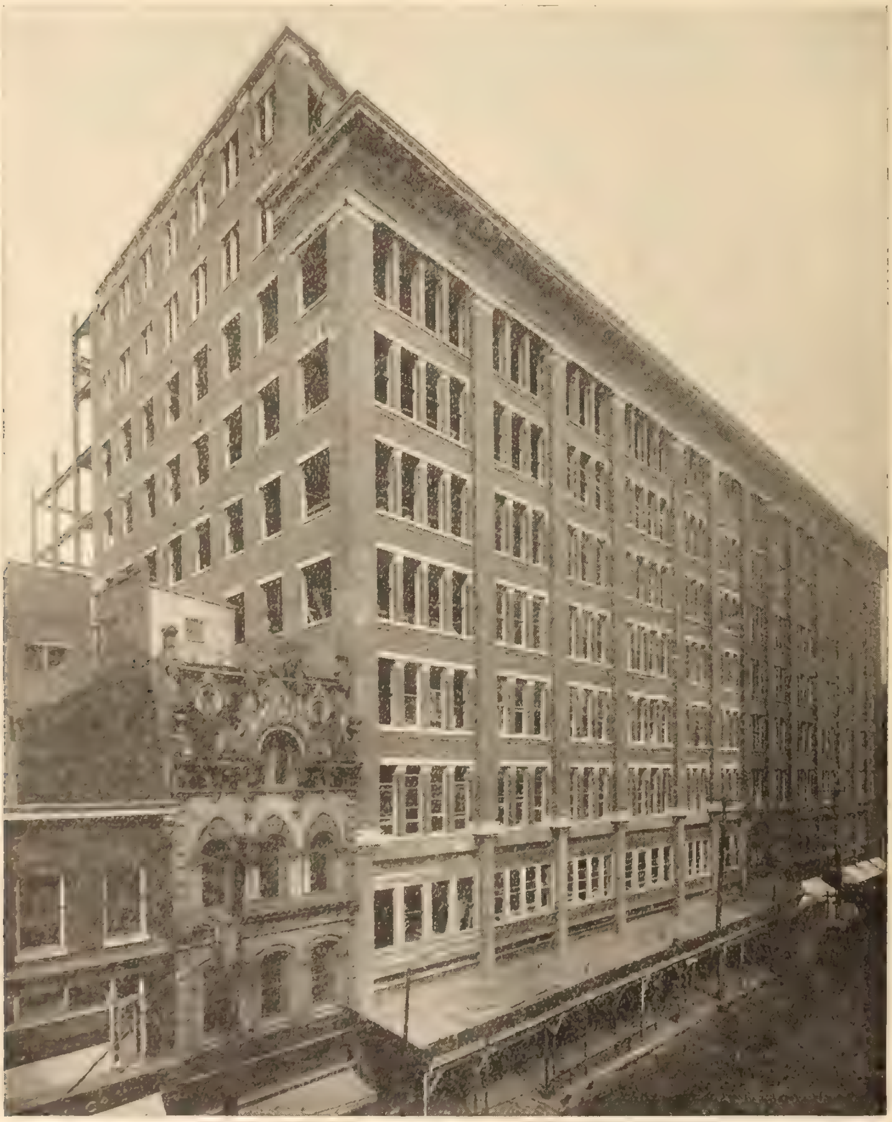
At a recent meeting of the American Construction Council at which action was taken to avert an immediate depression as well as to insure the nation against future inflation with peak prices and depression with business stagnation, the following preamble to a resolution was presented which has some interest to those who are following cost tendencies in these days of heavy construction activity:

> The volume of construction work projected this year exceeds by 40 per cent. the volume for the same period during 1922, during which year the facilities of the country for materials and labor were taxed to capacity. This results in a much larger program of construction in hand than can be properly and successfully taken care of with our present resources in manufacturing, transportation and labor.
>
> With these resources all over-taxed, the inevitable outcome is a bidding or auction process that means a very wide and exorbitant spread of prices between the manufacturer and the dealer and the consumer, with consequent rising costs to the manufacturer, to the dealer, and to the contractor, each of whom protects himself against "futures," the result being inflation injurious to the public.
>
> Similarly there is competitive bidding for labor, resulting not only in rising wage scales—which is the least part injurious to the public—but in bonuses which produce a depressing effect on labor in its efficiency of doing work, which efficiency in past times has been estimated to drop to no more than 40 per cent. normal. This is brought about by the insistence of the owner.
>
> This accumulative program of construction has resulted in making the cost of construction at the present time too high. An authoritative statement of conditions given to the public will help to a better understanding, and with a better understanding the peaks of construction should eliminate themselves. Particularly for the small investor is it unwise to do construction during the peak times such as exist today; and which give fair promise of being worse tomorrow. It is to the small investors that authoritative information should be given in the daily press of the trend of cost of construction and of the trend of future demands of labor and material; in construction, so that they may judge of the present for themselves.

Rapid Erection Features Reconstruction of T. Eaton Store, Toronto

Piers Placed and Lower Steel Assembled before Sub-basement was Excavated —Ten Storeys of Steel Erected in Record Time—Street Traffic Not Disturbed and Old Store Used till Last Possible Moment —Demolition of Old Building and Construction of New One Carried Out in Sections

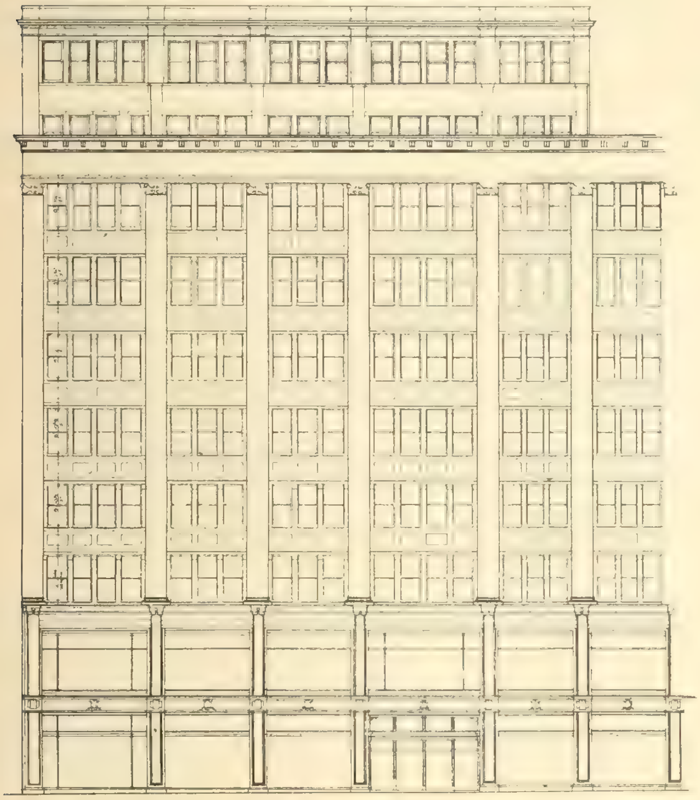
To provide additional floor space for their retail business and to obtain a store building adapted to modern requirements, the T. Eaton Co. Ltd., Toronto, have replaced a portion of their store with an up-to-date structure, 10 storeys high. The new building faces on Yonge St., with a frontage of 122 ft. and extends westerly 164 ft. The replaced portion of the store was 3 and 5 storeys high and adjoined on the north the 8-storey section which is a fairly recently built part of the Eaton store and is quite modern in design. The new building ties in with this part and preserves its architectural features.



The new 10 storey section of the store of T. Eaton Co., Toronto, adjoining an 8 storey portion constructed some years ago

While the new building is 10 storeys high above ground, the upper two storeys are set back one bay, so as to preserve the line of the cornice on the 8th storey of the adjoining section. The whole facade is carried out in the same design that characterizes the existing buildings, with brick pilasters extending from the 2nd to the 8th storey, resting on granite bases at the second storey cornice line and capped with granite capitals. The divided windows are set above brick panels and have stone sills and lintels. A brick frieze and metal cornice surmount the whole building.

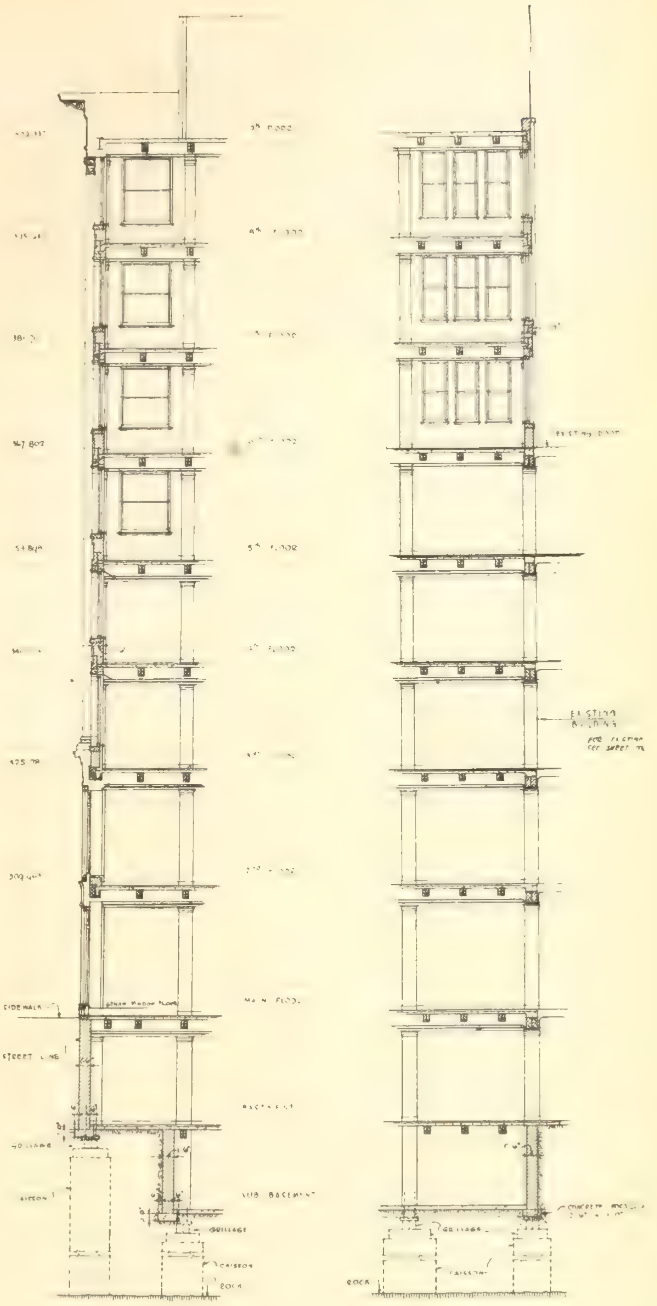
One of the outstanding architectural features will be a very rich bronze front, which will cover the entire building up to the height of the cornice at the 3rd floor. This bronze front will also be applied to the existing 8-storey section and will necessitate the removal of the granite pilasters that now feature that portion of the building. The bronze front will be replete with rich ornamentation and decoration, the pilasters being surmounted by lion's heads and each panel centred with a medallion design with a motif representing Commerce.



Elevation of new store

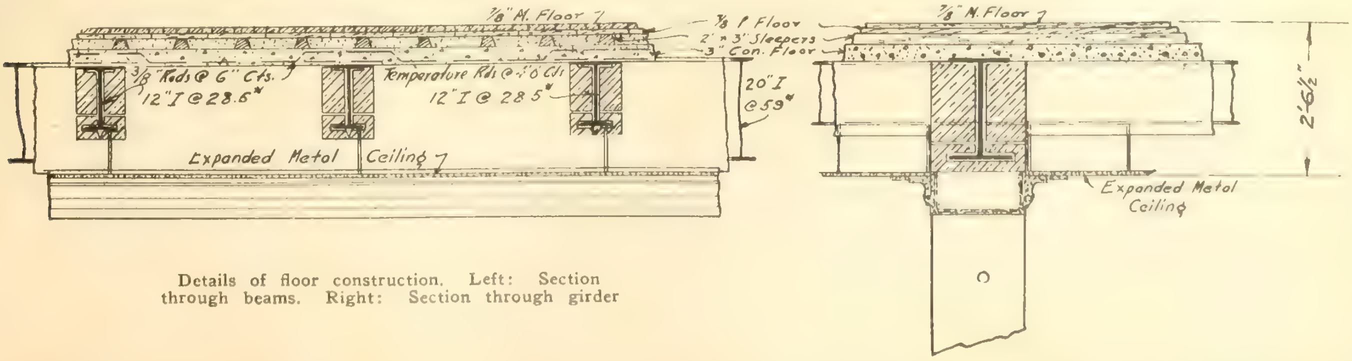
Another feature of the new building will be the dining room on 9th and 10th floors, which floors also contain kitchens. The dining room portion will have a clear height of 2 storeys and will be handsomely designed with walnut dado and cast plaster decorations. As mentioned before, this portion of the building is set back from the front one bay.

Another feature of the architecture is a public concourse which will extend parallel to the front of the building through the 2nd bay. On the outside will be show windows and on the inside show cases extending almost to the ceiling. In addition to the regular entrances on Yonge St., which will open into this concourse, additional access will be made by opening a doorway on Albert St. in the existing building.

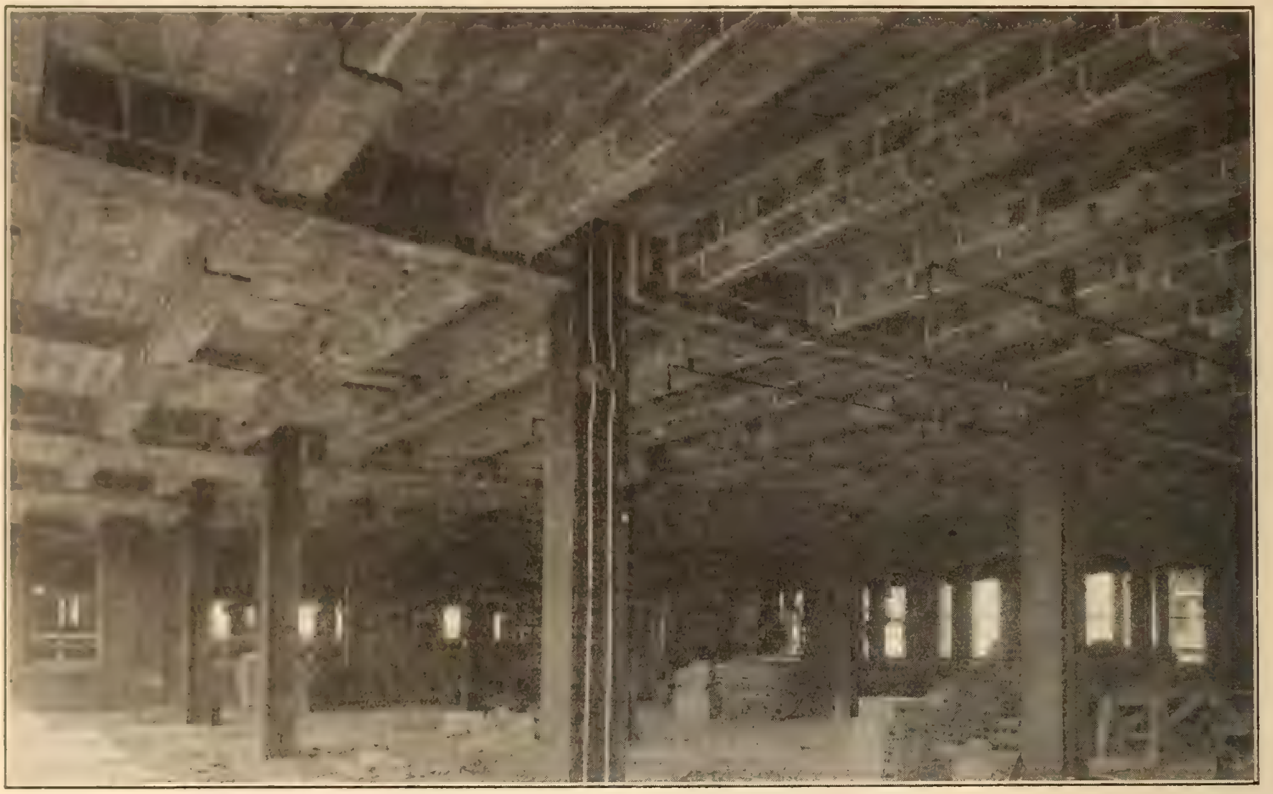


Sections through east and west walls

The new building is of fireproof construction throughout being designed with a structural steel frame, protected with hollow tile. The columns are rolled H sections plated where necessary, and resting on double tier steel grillages embedded in concrete, the grillages being carried on concrete piers extending to bed rock. The floor system comprises 18 and 20 in. steel girders and 10 and 12 in. I-beams. The floor consists of a 3-in. concrete slab and 2 by 3 in. sleepers embedded in tarcrete fill, covered with ⅞" pine and ⅞" maple flooring. On the ground floor a floor of Travertine marble, imported from Italy, is



Details of floor construction. Left: Section through beams. Right: Section through girder



A view of the fireproofing of the floor steel

employed. The designed live load for the typical floor is 100 lbs. per sq. ft. All columns are plastered over the hollow fireproofiing and with the exception of the sub-basement, suspended plaster ceilings on metal lath are used.

The fireproofing for the beams is a new type

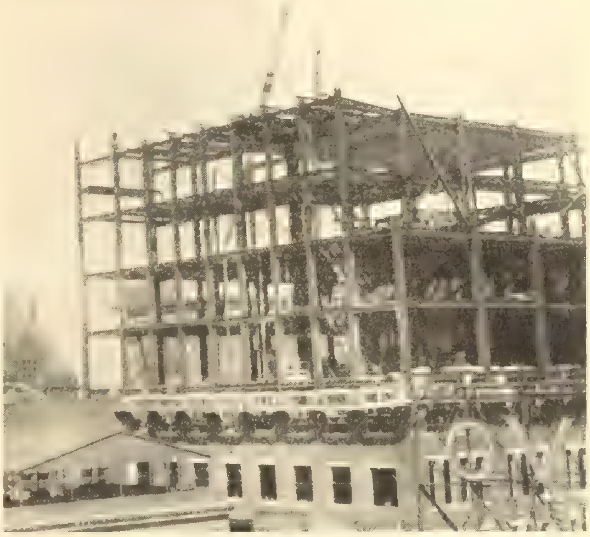
The ground floor is of Travertine marble, an imported stone of excellent value as a wearing surface developed by the National Fireproofing Co. of Canada, Ltd., which gives a two inch protection all around the flanges of the I-beams. It is easily laid up and is light and economical. It is possible to fireproof any width of flange up to 8 in. without a soffit tile being required. A new type of clip was used on this job for the first time. Promptness of deliveries made a quick job possible in spite of difficult working conditions.

The roofing will be 4-ply 15 lb. felt and gravel on concrete. The concrete will be swabbed with a heavy coating of pitch. Then four plies of felt will be laid 7½ in. to the weather, each layer of felt being securely sealed with pitch so that no dry felt will touch dry felt. Over this a heavy and uniform pouring of pitch will be poured into which while hot the best grade of lake-washed gravel will be embedded. The area to be covered is approximately 228 squares.

The building which has been replaced was of non-fireproof construction. The floor system comprised 1 1/8-in. maple flooring on 3 x 12 in. wood joists carried on double I-beam girders boxed with wood. The adjoining building on the north is more modern in type, being constructed with a framework of cast iron columns and steel beams. The beams are concrete protected and carry a concrete floor slab with a double wood wearing surface on a cinder concrete fill. No ceilings were used.

Steel erection in progress with brick work following closely

In the construction of the new store, several unique methods were adopted. The need of these was imposed on the contractors by reason of the fact that the store managment could not afford to sacrifice any floor space for any length of time, and furthermore because any interference with the heavy street traffic on Yonge and Albert streets could not be tolerated. It was also important that the work should be carried out during winter weather, so as to make the new store available for occupation as soon in the summer as possible. Consequently there was a considerable handicap in erecting the new building, which was reduced by dividing the reconstruction into four sections, commencing at Yonge St. and working westerly.



Steel was erected in record time. Two electrically operated stiff-leg steel derricks formed the equipment for erection

The importance of getting the steel structure up made it necessary to put in the foundation and piers without waiting for excavation. Consequently, the basement of the first section was separated from the rest of the building by hoarding that was very carefully constructed. In this way, without disturbing the activities of the rest of the store, the caissons were dug to rock, the concrete footings poured and steel grillages set.

The lower steelwork was then erected in deep trenches before any considerable excavation was carried out. The steel for this basement portion was brought in at night from Albert St. through the basement of the store. "A" frames guyed over the caissons were used for the erection. This procedure, of course, prohibited the use of a steam shovel for digging out the excavation and, in fact, the steelwork was up to the 4th or 5th storey before any considerable excavation started. During the time that this work was going on in the basement, the contractors for the steelwork, Messrs McGregor & McIntyre, Ltd., placed on the roof of the existing part of the store to the north, an all-steel stiff-leg derrick, operated by a powerful electrci hoist. The boom extended out over the building to be demolished and the stiff-legs were anchored by cables running through the roof at the 8th and 7th floor levels. The remaining floors in this section were then segregated from the rest of the store by hoarding and in about 10 days' time the old building was demolished. The steel erection then commenced and inside of 17 working days was completed. For this purpose the aforementioned stiff-

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Do Single Track Concrete Roads Pay?

The Experience of Brant County, Ont., Proves that a Nine-Foot Slab on One Side of the Centre Line with a Gravel Track on the Other is a Financial Expedient

By A. M. JACKSON
County Engineer, Brant County, Ont.

Before the Canadian Good Roads Association

I consider single track roads a financial expedient. Nobody would build a hard surfaced road wide enough for one vehicle only at a time, if they could afford to build it wide enough for two. A single track road, however, will go twice the distance a double track will go for the same money, and the question resolves itself into this: will you have twice the length and half the width, or twice the width and half the length. These statements are not absolutely precise, but I have found that a 9 foot concrete slab laid on one side of the centre line of a road, with a 9 foot gravel track on the other side of the centre line costs from 57 to 60% of the price of an 18 foot slab. This comparison is made on the basis of the turnpike required by the Ontario Department of Highways for a provincial-county road, viz., 28 feet from shoulder to shoulder. It will readily be seen that the actual grading and ditching for both types would be the same, that the water supply for mixing and curing the concrete would be the same for both types, that the cost of actual laying would be slightly greater in the case of the narrow type on account of the increased amount of moving of the plant and forms, and finally, the principal reason why the one type costs more than one-half of the other is the addition of a gravel track beside the concrete.

Mr. A. M. Jackson

The Brantford Suburban Area Commission was, on the principle of pay-as-you-go in 1920, in the position of having just sufficient money to maintain their roads and to build one mile of 18 foot concrete road each year. Their two heaviest travelled roads were the two main market roads with a suburban area of four miles on each. Eight miles of full width concrete road would mean that it would be eight years before the last ratepayers were served. The Commission decided to build half-width concrete and to place the slab on one side of the centre line. Two miles were built in 1921 and two miles in 1922 and the other half of the roadway constructed of crushed, pit-run gravel. The experiment appears to have justified itself and at the end of four years instead of eight the ratepayers on both these roads will have an every-day-in-the-year road to their market town.

The Cause of Failures

Strandard practice in the laying of concrete roads has undergone marked improvement and change since 1917, and it seems unnecessary that I should dwell on this phase of the subject. However, it would appear to me that a number of the failures in concrete pavements have been partly due to the want of uniformity in the sub-grade. I feel that in so severe a climate as we have, the sub-grade for a pavement should always be prepared a year ahead of the actual concrete laying. The prepared sub-grade should conform as nearly as possible to the contour that will be adopted under the pavement. For an 18 foot slab this would be flat, while for a half-width slab on one side of it might have a fall of two inches towards the ditch. The proper banking on curves should be provided in the sub-grade at the same time so that the whole will settle uniformly. The sub-grade should be coated with gravel or stone and a fall, winter and spring allowed to pass before any concrete is laid. This coating of six inches of gravel or stone should be strengthened where weaknesses have shown and would provide a uniformity of sub-grade not usually obtained when the work is done immediateyl in advance of the mixer. This coating will not only serve the traffic over the prepared sub-grade, but will tend to reduce the condensation and accumulation of water under the concrete which is a prolific cause of heaving, uneven settlement and cracks.

On four miles of concrete pavement laid by the Brantford Suburban Area Commission in 1921 and 1922, on one side of the centre line, the sub-grade was prepared as stated. The slab was seven inches thick throughout and was tilted two inches. One was laid on the centre line of the turnpike and nine feet of pit-run gravel was laid alongside in two layers and consolidated by traffic. The concrete was 1:1½:3½ using 2 inch to 3/8 inch crushed stone and a grade of coarse sand which proved satisfactory under the standard color test with sodium-hydroxide. The stone was hauled to a central stock pile in the winter and a central proportioning plant was established here. Measured batches of stone and sand were hauled by trucks divided into separate compartments to the mixer, the truck backing down between the side-forms set 9 feet apart to receive the concrete. At the mixer the trucks were up-ended as for dumping, and a batch at a time was shot into the hopper of the mixer where two bags of cement were added. Owing to the sub-grade having been prepared the previous year, and simply skimmed to true contour ahead of the mixer, the trucks seldom made any impression on the sub-grade; when they did, soft material was removed and crushed gravel added and rolled. This test of the sub-grade has the obvious advantage of showing up weak spots before they are coated and finally put out of sight to cause subsequent cracks and settlement.

Details of Construction

Mixing was for 1 to 1½ minutes in the drum after water had been added by an automatic measuring device and placing was by boom and bucket. Hand tamping was used and this heavy work as well as the finishing was found easier to do well on the narrow pavement than it was on an 18 foot slab. Water was supplied from a 2 inch pipe line and pumped from a creek by a triplex pump with a booster pump one and one half miles up the line. The water had to be pumped a maximum distance of three and a half miles. An average of about 400 lineal feet laid per day was obtained, with big days of from 600 to 650 feet. Three-eighth inch elastic joints were placed every 40 feet in 1921, and 50 feet in 1922 and also at stoppages. The green concrete was covered for a day with canvas on frames and then coated with earth and wetted continuously for three weeks. The slump test was used and up to a two inch slump allowed.

This has resulted in a pavement without any longitudinal cracks. There are forty-six transverse cracks in four miles, including one diagonal corner crack. Many of these are hair cracks and not open sufficiently to be repaired with tar. In several cases two cracks have occurred in the one slab and they have invariably occurred a little below the summit on rises. No increase in number seems to be due to the extra length of slab adopted latterly, and the entire absence of longitudinal cracks due to the half-width type is very satisfactory. All curves were banked, but in the first season's work where the slab was on the outer side of the curve, no widening was used because it was figured the widening would be added on the inner side of the second slab when the road was double tracked. This was a mistake which had to be remedied the second season. Widening of the curves on a single track road is even more necessary than on a double track, and should, I think, be proportionately somewhat more. The standard allowance of one-half inch per foot for banking on curves of three hundred foot radius was used and this, I consider, should be increased where the curve is also on a grade, otherwise the destructive action of side-slipping is liable to become evident and with insufficient widening would call for heavy maintenance of the gravel at the edge of the slab.

No Rutting is Noticeable

Criticism of the method of having one-half of the surface of gravel and the other of concrete has been that there would be a rut formed at the centre of the road along the edge of the slab. Up to date this has not been the case, but banking and widening on curves should be carefully provided for or such ruts would form. The gravel part of the surface has been kept dragged smooth and well up to the concrete, our endeavor having been to keep the gravel slightly over-lapping the edge of the slab. Extra material has been added to the gravel when it has become consolidated below the slab and the ready adherence of new material in very thin layers to the existing gravel road is one point which, I think, makes this type of construction more suitable in gravel counties than in those where only macadam is used.

The cost of dragging on this road has been approximately one-fifth of what it was when the whole surface was gravelled, and I estimate that with a vehicular traffic of something over five hundred per day during the summer, that 90% of the travel is on the slab.

There have been several accidents on this road since it was paved but not due to the method of paving on one side of the centre line, which has the effect of so clearly showing where the middle of the road is that there can be no mistake made about it by the most inexperienced driver. The side of the road paved was that going out of town because changes in the alignment of old grade gave heavy fills on the other side. I think there is probably argument in favor of the pavement being laid on the into-town side, though the gravel road can be kept so smooth that some vehicles will keep on it entirely rather than bother to run on the slab and turn out when overtaken. There is no perceptible jar in turning on or off the concrete. Notice boards stating that west bound traffic has right-of-way on the concrete were set at conspicuous points on the road and have apparently served their purpose, as no difficulty has been experienced with persons not observing the rules of the road.

Financial Aspect Must be Considered

Main market roads as a rule are those constructed by the county and to finance the full paving of all a county's main market roads would be a burden greater than any county could bear unless it were assisted to an unusual degree by contributions from the provincial and urban areas. The great majority of main market roads in this province would undoubtedly fall into the class with a vehicular traffic of up to five hundred per day, while a small percentage would come in the class of five hundred to one thousand vehicles per day, and it seems doubtful if any road carrying more than a thousand vehicles would still belong to a county system, as such have now been assumed by the province as provincial highways. At the same time there must come a period on almost all main market roads when the matter of a hard top has to be considered, and it seems that to build only full-width pavement would mean leaving out of the programme a very large proportion of the main market roads because of the great cost of such paving. The question of finance must then bring up the desirability of some expedient where traffic reaches five hundred vehicles per day and this seems to me to be met satisfactorily by a half-width strip of concrete laid beside a strip of the same width of gravel.

It must always be borne in mind that the people can only have that type of road for which they can afford to pay. When it becomes economical to provide a simple track of hard surface, I believe the logical place to put that single track is with one edge on the centre line of the road and not in the centre of the turnpike. There are several reasons for this opinion. The other half of the road surface can be more easily and effectively constructed than where the hard surface is in the centre and the balance has to be made up of two narrow strips, one on each side. The duplication of the hard surface can be more easily and economically constructed in one wide strip than in two narrow ones and only one longitudinal joint is formed when traffic warrants the widening of the hard surface and this, in the centre, forms a good division line for traffic. With the edge of the hard surface on the centre line, the person on whom the onus of turning out falls cannot be a matter of dispute.

Cost of Single Track Roads

Regarding costs, I would say that these are bound to vary tremendously in different localities, so that the figures which I give are more for comparsion than to be taken as the actual cost today of the different types. From data I have been able to obtain and check from my own experience, an approximation of construction and maintenance costs on such a comparative basis is as follows:—

Type	Cost to build Per mile	Maint. up to 500 vehs. Per day	Maint. up to 1,000 vehs. Per day	Maint. up to 1,500 vehs. Per day
18 ft. concrete	$40,000.00	$ 100.00	$ 200.00	$ 300.00
9 ft. concrete & 9 ft. gravel	23,000.00	200.00	400.00	1,600.00
18 ft. gravel	6,000.00	1,000.00	2,000.00	4,000.00

To retire the cost of a concrete pavement, 18 feet wide, in fifteen years at 5½% per annum will require an annual payment of approximately 10% of the principal sum or $4,000.00 and with $100.00 per mile for maintenance would represent an annual cost of $4,100.00. Treating the cost of a half and half gravel and concrete road in the same manner would represent an annual cost of $2,500.00, and similarly for a gravel road an annual cost of $1,600.00. Now taking the case of roads with a vehicular traffic up to one thousand per day, these three coats would become: for concrete, $4,200.00; for gravel and concrete, $2,700.00; and for plain gravel, $2,600.00.

From a study of the foregoing, it will be seen that where gravel is used for one track and concrete for the other with the traffic from five hundred to one thousand vehicles per day, the half and half type of road will be more economical than a full-width concrete pavement and preferable to a full-width gravel road in that the cost per mile over a period of fifteen years is almost the same, but the advantage of a hard surface on part of the width would far out-measure any such small difference in cost as $100.00 per mile.

Gravel Preferable

The type of construction which I have been describing would appear more suitable in what I would call a gravel and concrete county than in one in which no gravel is to be found, and where all roads must be constructed by some of the various combinations of crushed stone and bitumen. I have not had the experience of constructing macadam on one-half of the road surface with concrete on the other. On account, however, of the tremendous destruction caused by motor trucks during the war of the finest macadam roads to be found anywhere—I refer to the roads in Scotland where Macadam was born—the Transportation Commission for Great Britain advocated two feet concrete wheel tracks in the existing macadam roads, so that it was obviously considered that this form of construction was quite feasible. Let me say, however, to those building roads in counties where no gravel exists but only stone, that I have built in some gravel roads stretches of pit-run crushed stone with all stone over one inch removed. These stretches were laid and treated in exactly the same manner as the adjacent stretches of crushed gravel and under a heavy traffic of narrow tired overloaded Ford Trucks running to a milk factory have stood up satisfactorily and like a gravel road can be dragged and kept smooth throughout their life. When such roads are worn down to half their original thickness they still have this advantage over macadam that they can always be kept as smooth as when newly constructed by the simple process of dragging.

Services that Provincial Highways Render

What is Being Accomplished by the Ontario System, Which Comprises All the Important Routes in the Province—A Paper Read at the Recent Convention of the Canadian Good Roads Association

By GEO. HOGARTH
Chief Engineer, Department of Public Highways of Ontario

In the time allotted for this paper it is not possible to present all details and aspects of Provincial Highway Systems and the various forms of permanent construction. The object will therefore be to give only main essential data having a general application to all systems.

Provincial Systems of Highways have become necessary because of the insistent demand of the public for improved roads connecting up the main centres of population and affording access to those centres during all the months of the year. Methods of highway improvement whereby small isolated sections of road were improved have become obsolete as much patchwork was unsatisfactory and a broader policy of continuous well built main roads was urgent.

The actual designation of Provincial Highways is the work of the last few years and an examination of the maps of the connected systems of roads of the Provinces of Canada show that already a vast effort has been made to serve by means of connecting highways all the main centres of population. Such a linking up of the villages, towns and cities together with the populous country districts through which the roads pass can only result in benefits to the people beyond our greatest expectations. Some of those benefits of better highway accommodation are plainly evident on improved roads today and may be seen in the improved social, educational, and financial conditions. Farms located along such roads are sought after and command a higher price and if lands are offered for sale the fact that they front on a Provincial Highway is emphasized as making the property attractive and more desirable, which tends to the financial advantage of the vendor.

All the Provinces have designated a connected system of Highways, and a tabulation of the mileages of roads included in the Provincial Systems together with the estimated outlay and total expenditure is as follows:

Statistics showing mileage of roads in Provincial Systems together with estimated outlay:

Province	Mileage	EstimatedOutlay		Total
Alberta	2475	$ 2,216,715	Provincial	
		1,477,810	Federal	$3,694,525
British Columbia	1977	8,763,095	Provincial	
		1,251,955	Federal	10,015,050
Manitoba	4000	5,000,000	Provincial	
		1,602,265	Federal	6,602,265
New Brunswick	1595	1,745,767	Provincial	
		1,168,845	Federal	2,914,612
Nova Scotia	1297	11,025,000	Provincial	
		1,468,700	Federal	12,493,700
Ontario	1824.7	4,400,000	Municipal	
		12,000,000	Provincial	
		5,800,000	Federal	22,200,000
P. E. I.	850	510,000	Provincial	
		340,000	Federal	850 000
Quebec	1433	12,641,580	Muni'l & Pro'l	
		4,748,420	Federal	17,390,000
Saskatchewan	7000	3,523,245	Provincial	
		1,806,255	Federal	5,329.500
	22,451.7			$81,489,652

Thus it will be seen that the Provinces to-day have mapped out very extended connected systems of highways involving in the course of a few years the expenditure of more than $81,000,000.

These roads are being constructed of various types such as earth, gravel, macadam, bituminous penetration, asphaltic concrete and concrete, each selected to best suit governing conditions such as the funds available for construction, the local traffic to be carried, the geographical position of the road, and local material available for construction. All roads in the systems cannot be paved nor is it expedient, desirable or possible that they should be built with any higher type of surface than will satisfactorily serve the public. In some sections a well-drained, well-graded earth road will serve all local requirements, whereas the same type of road used in another locality would not carry traffic for a few hours.

An examination of the Provincial Systems indicates the serving of the needs of local and through traffic by the roads designated.

The 850 mile system of Prince Edward Island makes a complete circuit of the Province and connects almost every town and village with a good road.

The 1297 mile system of Nova Scotia serves the sea-coast towns and cities and has in addition to the coast roads, highways extending across country to link up the different sections.

New Brunswick with 1595 miles of connected roads is completely circled thereby and branches of the system cross the Province in such directions as to serve the important centres.

The Province of Quebec with 1433 miles has south of the St. Lawrence River a well distributed network of roads extending from Matapedia to Valleyfield, while north of the St. Lawrence an isolated system serves the Lake St. John district and a continuous road with branches extends along the north shore of the St. Lawrence and the Ottawa.

Ontario with a system 1824.7 miles in length has served all the counties of the southern portion with a main road from Quebec to Windsor and branches connecting every city including and south of Owen Sound.

In the districts of Ontario from Muskoka to Kenora excellent work in the nature of through trunk roads is being carried on and the linking up of these roads between the north shore of the Georgian Bay and Lake Nipissing westerly to Fort William and Kenora will eventually provide the Highway connection between Eastern and Western Canada.

Manitoba's system comprises 4000 miles of checkerboard road design covering the whole of the settled portion of the province and having many roads radiating out of Winnipeg.

The 7000 mile system of Saskatchewan serves all the country south of Prince Albert with roads linking up all the centres and criss-crossing the province from East to West and North to South.

Alberta's 2475 mile system is designated as a main North and South highway from Peace River Crossing to the International boundary with branches leading East and West to the provincial boundaries. Unfortunately financial conditions are delaying the province in building Main Trunk Highways.

Mr. Geo. Hogarth

British Columbia has a system 1977 miles in length upon which work is proceeding so that a linking up of the main routes will shortly be accomplished.

The selection of the type of road to build if properly made and popular may gain support for the Good Roads movement. The present wonderful development in road building is due to the widespread popular support of the people who have approved of all road improvement proposals, and the confidence of the people calls for the exercise of engineering skill and tact.

The rapid completion of a number of miles of gravel road on an Ontario Provincial Highway recently was commented on by local people who said: "the people around here are satisfied with what you have done. They did not understand at first why the grading and widening was being gone on with, but now it is completed and the road gravelled, we have one of the finest sections of highway in Ontario and we support the Department in its work."

Roads included in Provincial Systems of Highways are the important routes of travel in any particular territory and in assuming any road for improvement the commercial and industrial value of the road requires careful examination, so that when completed it may return to the people in service many times the cost of the improvement. The people want service today and service consists in making and keeping the important roads smooth for their entire length so that haulage of the produce of farm or factory may pass along in a continuous flow uninterrupted by bad sections or quagmires, and the greatest problem before us today is to give as quickly as possible the benefits of good roads to all the people, and at the same time make commercially useful roads.

As the highways improve road transportation changes, and, from trips involving short journeys, we find as the good roads are connected up, that more people and firms use their cars and trucks for long trips for business and pleasure. Business firms today are using more trucks than ever before. These trucks make longer journeys because of the continuous connected good road, whereas a few years ago the sections of bad road encountered discouraged commercial use because of breakdowns and costly repairs to motor transport.

Many considerations arise when making locations for roads to form a Provincial Highway system. Roads cost money, and when built must serve the greatest possible number of people, so that a location that passes through a comparatively well populated district is most desirable. The service that the road will give is then assumed and at the same time construction costs are kept down because local labour is readily available.

Choose the most direct route between main centres of population, if all other considerations are equal and favour that route having easy grades, feasible costs of construction and local deposits of good gravel or rock for surfacing.

Avoid a location that crosses deep ravines and has sharp curves as such difficulties are costly to remedy and a source of danger to travel.

In locating a road one consideration that is receiving more and more attention is the placing of the road where scenic beauty spots abound so as to furnish an added attraction for the tourist. Canada has many such beauty spots and they are a great asset with which to popularize the various provincial systems.

Adapting Construction to Conditions

In a number of the provinces today our systems of roads have been established for several years and we are at present vitally concerned with the problems connected with the actual work of constructing, maintaining, and making safe for travel all the roads assumed. Funds provided even for Trunk Road construction are not limitless, and in Canada we are faced in some sections with sparsely settled country where heavy construction costs simply cannot be considered, and where the narrowest and cheapest type of earth or gravel road must serve traffic for years to come. Thus the amount of money that can be justifiably spent in building a mile of road is not the same in all parts of any Province. Highways leading away from important cities must be constructed to carry constant traffic of the heaviest description which demands the most permanent pavement construction known to the science of Highway engineering. At a distance away from the same city the volume and weight of traffic is possibly smaller and a well-built gravel road constructed at a fraction of the cost of a pavement will give the utmost satisfaction. In between these two extremes of heavy and light traffic there lie many possible traffic counts to which such types of road as thin and thick Waterbound Macadam with surface treatment, and bituminous penetration give good service at costs less than those for pavements The kind of earth or soil upon which a road is to be built and the local materials available for building may dictate the type of construction to be followed. A soft clay sub-grade that retains water and is located where traffic is not very heavy and no local material available may call for the construction of a pavement as being the most economical road that can be built, but if local gravel or stone are available a gravel or macadam roadway would be sufficient. A sandy sub-grade with local gravel or stone available may justify a macadam roadway under certain traffic conditions and under other conditions may require a gravel roadway or a pavement.

In any system of Highways certain standards of construction require to be established. For economical construction the standards established need not exceed those rigidly set by traffic requirements. Such standards are usually those of maximum grade, minimum radius of curvature, carrying capacity of structures, width of roadway and width of gravelled or paved surface.

Grade

The maximum grade established affects the commercial value of the road, but with a maximum of 7% practically any truck in low gear can negotiate the grade. Minimum radius affects the safety of the road and the ease with which it can be driven since a road with right angle turns causes all traffic to slow down to make any turn. Right angle turns are also dangerous because of liability of accident at the intersection. A good minimum radius of curvature at turns is 300 feet and on all curves the outside edge of the roadway if raised or banked about 18 in. will assist the drivers. The usual standards for strength of structures is for the bridge or culvert to carry a ten to twenty ton road roller.

The Width of the Highway

The width of road allowance for Highways deserves attention. Forty years ago in Canada highways were used in almost all cases solely for horse drawn vehicles. Today the road allowance must provide not only a highway, but also space for sidewalks, trees, rural free mail boxes, telephone poles, electric light and power poles, conduits or pipes for wires, water and gas, and in some cases space for electric railways. In some thickly populated sections of Ontario all these services are on the highways, and the space left for the travelling public has been so restricted that only a narrow pathway is left for the vehicles.

Original road allowances were seldom or never more than 66 feet, while in some cases 40 feet was considered sufficient. Trees and hedges were planted along the edges of such roads and in winter the road allowance was so choked with snow, it became impassible. Owners were not particular in rebuilding fences whether the new fence was put on the correct line or cut on the road so that gradually even the 66 foot road allowance was narrowed by encroachments till only 50 feet or less was left between fences.

For adequate construction wide road allowances are necessary and in Ontario in order to provide for all the services required an allowance 86 feet in width is being secured. This is usually obtained by widening the road ten feet on each side unless some physical obstacle make a different arrangement necessary. Experience has shown that with wider road allowance and wider roadway excavations snow blockades are not as frequent or severe.

The width of paved, gravelled, or earth surface of Provincial Highways varies as shown by following table:—

Paved Width of Highways

Province	Cement Concrete	Bituminous Concrete	Bit. Macadam	W. B. Macadam	Gravel	Earth
P. E. I.						18′
Nova Scotia			16′	14′	12′ to 16′	18′
New Brunswick			16′		18′	24′
Quebec	14′ to 16′	16′	14 to 16′	12′ to 18′	18′ to 24′	24′
Ontario	18′ to 20′	20′ to 30′	16 to 20′	20′ to 22′	20′	30′
Manitoba					16′	16′ to 24′
Saskatchewan					16′	20′
Alberta						16′ to 24′
British Col.	16′ to 18′	14′ to 18′			10′ to 20′	16′

Drainage

Drainage has been said to be the prime need of all good roads, and the open ditch placed on each side of the road has in very many cases made a dry road where formerly only a quagmire existed. In places where the road winds along the foot of a hill or where the ground slopes sharply down to the road an open ditch dug on the high side of the road has demonstrated how the seepage of ground water can be stopped and the road kept dry. The open switch in such cases forms a barrier which the ground water cannot pass.

Tile underdrainage is effective for wet spots which develop in the subgrade. A trench opened from the wet spot to the side ditch with tile placed in the bottom of the trench and backfilled with gravel or crushed stone is very effective in preventing sink holes drying up the subgrade.

Cobble gutters are details of construction frequently needed on grades where the soil is soft and easily scoured away. Ordinary field stone six to ten inches or more in diameter used as a bedding to protect the bottom of the ditch will prevent the water scouring away the soil and endangering the safety of the road.

Making the Road Attractive

Details of fencing must be prepared in some cases, and a well set uniform fence is an added attraction to any road. Woven wire fencing is the commonest form in use today and a nine strand 52-inch fence with sound cedar or substantial steel posts has a good appearance.

The use and planting of trees deserves every encouragement. Foliage serves a useful purpose in sheltering the road during the hot summer season and there is nothing more beautiful than a well-kept road with a border of native trees. The kinds of tree best suited to the road are those that are native to the country, and planted in locations where they will thrive.

In dealing with electric light, power and telephone companies, it will be found that telephone companies do not wish to have their wires on the same side of the highways as power companies, and the allotment of one side of the road to power lines and the opposite side to telephone companies is one solution of the difficulty. The poles, if kept well away from the centre of the road will still be in good operating position and leave plenty of space for the use of the highway.

Pipe lines for water and gas are frequently necessary and a location for the lines selected where ordinary repairs can be executed without having to dig up the road is a great help in maintaining any highway surface.

Culvert and bridge construction brings up the question of the loads our structures should be designed to carry. The tendency is today to limit the loads of our trucks and so reduce the total load that can be brought on a bridge. We still have however our road rollers weighing ten, twelve, or fifteen tons and more, and in various districts structures designed to carry such loads or even a twenty ton load will prove adequate and economical.

Concrete as a bridge and culvert building material lends itself readily to use for structures of the usual span lengths and steel construction to situations requiring flexibility in the structure.

Guardrails for Safety

Guardrails will be found necessary on embankments of say over four feet in height, and a white painted timber rail is cheap, easily erected and serviceable. Such a guardrail is not intended to be an unbreakable barrier to prevent cars or trucks leaving the road due to accident, but is placed solely as a warning to indicate the point where danger commences. In Ontario our timber guardrails were being continually wrecked by cars striking the boards and posts, and many serious and costly accidents occurred where cars plunged completely through the wooden rail. We are therefore using today a three quarter inch wire rope threaded for the full length of the guardrail through the posts, and placed about eighteen inches above the ground. If the guardrail is at a particularly dangerous location on a high embankment we use heavy posts and two wire ropes, the lower eighteen inches above the ground and the upper thirty-six inches above the ground. Experience with the wire rope guardrail has shown that a truck or car has not so far gone through the wire rope but the vehicle coming in contact with the rope has been stopped or thrown back on to the roadway. In such a collision one or more posts may be broken but they are easily and cheaply repaired.

As an instance of what the public thinks of the wire rope guardrail, we have been thanked for building it and have been told by travellers that the wire rope undoubtedly saved their lives by preventing the car leaving the road.

Roadside beautification requires attention along with the development of the whole system of roads. As the roads are improved and farms are cut into smaller holdings more houses per mile are found along the highways and with population comes a desire to improve the frontages of the houses. The people take pride in keeping their own particular front clean and tidy, and any unsightly conditions on the highway must be remedied. A neatly kept ditch and roadside free from trash, rubbish and weeds is very attractive, and when bordered by stately trees is a great asset to the community.

Economic Value of Good Roads

There is a cash value to good roads in the saving of wear and tear on vehicles that cannot be too strongly emphasized. The benefits of good roads are shown by the reduced cost of maintenance and longer life of automobiles run over good roads on one hand and bad roads on the other. One type of car with which you are all acquainted and of which the Department has a number has been used by us since 1917 when our highway system was first assumed. The cars bought in 1917 and 1918 were run over the roads in the condition the highways were in when taken over and in some cases the cars were practically wrecked in a season's wear. When turning in such cars and renewing them we were allowed a sum of money which represented an average depreciation exclusive of repairs of $240.00 per car per year. In 1923 we turned in a number of cars for replacement and the actual depreciation was $125.00 per car per year. This is a saving in depreciation alone of $115.00 per car per year. With 272,000 cars and trucks in Ontario, many of which are more expensive than the car above referred to and half of which are owned outside the cities there would be a saving of $15,500,000.00 per year on depreciation on cars and trucks owned outside the cities, and using the low value of $115.00 depreciation per car per year.

Gravel as Permanent Construction

Permanent construction to the Good Roads enthusiast is the smooth, hard paved surface that he delights to glide over. To the engineer it means the building of solid embankments to carry the roadway, the erection of drainage and offtake ditches to protect those embankments, the building of concrete or steel culverts and bridges to carry the roadway over watercourses and rivers, the hill cutting and grading operations to secure easy flowing grades, and, in some cases the curb and gutter, catch basins and storm drains needed in the villages and towns. The last work the engineer does is to provide the so called permanent surface or permanent construction, and all his efforts have heretofore been directed to securing some kind of a permanent subgrade upon which a reliable surface can be built Concrete or bituminous surfaces have been the accepted forms of permanent construction. Today we would add to this list the gravel road which is so easily and cheaply maintained, is pleasant to drive over, dustless when treated in dry weather, does not break up in the spring or the fall, and for smoothness has no equal. Besides it is easily constructed, readily maintained without costly equipment and gives unequalled satisfaction under fairly heavy traffic.

Gravel roads may be built with ordinary inexpensive road building equipment such as wagons, or if modern machinery such as steam shovels and trucks are used long stretches of road may be quickly given an excellent surface. The width of the gravelled section is best twenty feet and the depth used may be anywhere from three inches to twelve inches, but if a greater depth than three inches is placed it should be carefully spread and applied only in layers of two or three inches in thickness and each layer thoroughly dragged and consolidated by traffic before the next layer is laid. This method produces a surface free from waves or bumps, gives a passable road in the shortest possible time, and costs less than the usual way of piling on the gravel in a heap feet in depth in the centre of the road.

During dry weather the gravel may be kept dustless by the application of oil tar or calcium chloride and today we have hundreds of miles of this type of highway that has been cheaply and rapidly built and with which our people are thoroughly satisfied.

Macadam Construction

Where traffic conditions are heavier than a gravel road will carry and where possibly rock instead of gravel is available along the road, a macadam roadway say twenty feet in width and five inches to eight or ten inches in thickness will, under good maintenance, give satisfaction. The surface of the macadam in order to be protected from the wearing action of the wheels of traffic will require annual or semi-annual treatment of a light bitumen sprinkled with coarse sand or stone chips. Such a road, well maintained, will last for years and give good service, and even when worn out can be used as a foundation for a better type of surface.

Bituminous Penetration

Under more intensive traffic the macadam road may become ravelled and shattered and a stronger surface of crushed stone bound together with hot bitumen and called a bituminous penetration or bituminous concrete surface may be constructed. This penetration crust is usually about three and a half inches thick and is supported on a good foundation six inches or more in depth. An annual surface treatment of bitumen and coarse sand or stone chips will be required to keep the road sealed tight and flush so that wear on the stone may be prevented.

Concrete and Asphaltic Concrete Surfaces

The next higher type of pavement surfaces are those two usually referred to as permanent surfaces, namely concrete and asphaltic concrete.

The cost of pavements is such that they can only be justified in areas in the immediate vicinity of cities where traffic is heavy and the people demand and are willing to pay for a pavement.

Concrete pavement is well known to the people in many sections of Canada and is a road surface that is satisfactory. Continued observation of concrete pavements on busy highways and recent tests under heavy traffic conditions have indicated modifications in the design of the pavement with the object of eliminating or reducing the cracking. Reinforcing of the slab, the elimination of tranverse expansion joints, the substitution of a center joint and the thickening of the slab from the usual six inches at the side to eigth or nine inches are being advocated as improvements in design tending to give a longer life and better riding surface.

Asphaltic concrete may be laid two or three inches in thickness upon a solid macadam or concrete foundation. The surface is smooth to ride over, is easily kept and can be rapidly repaired or maintained as necessity arises.

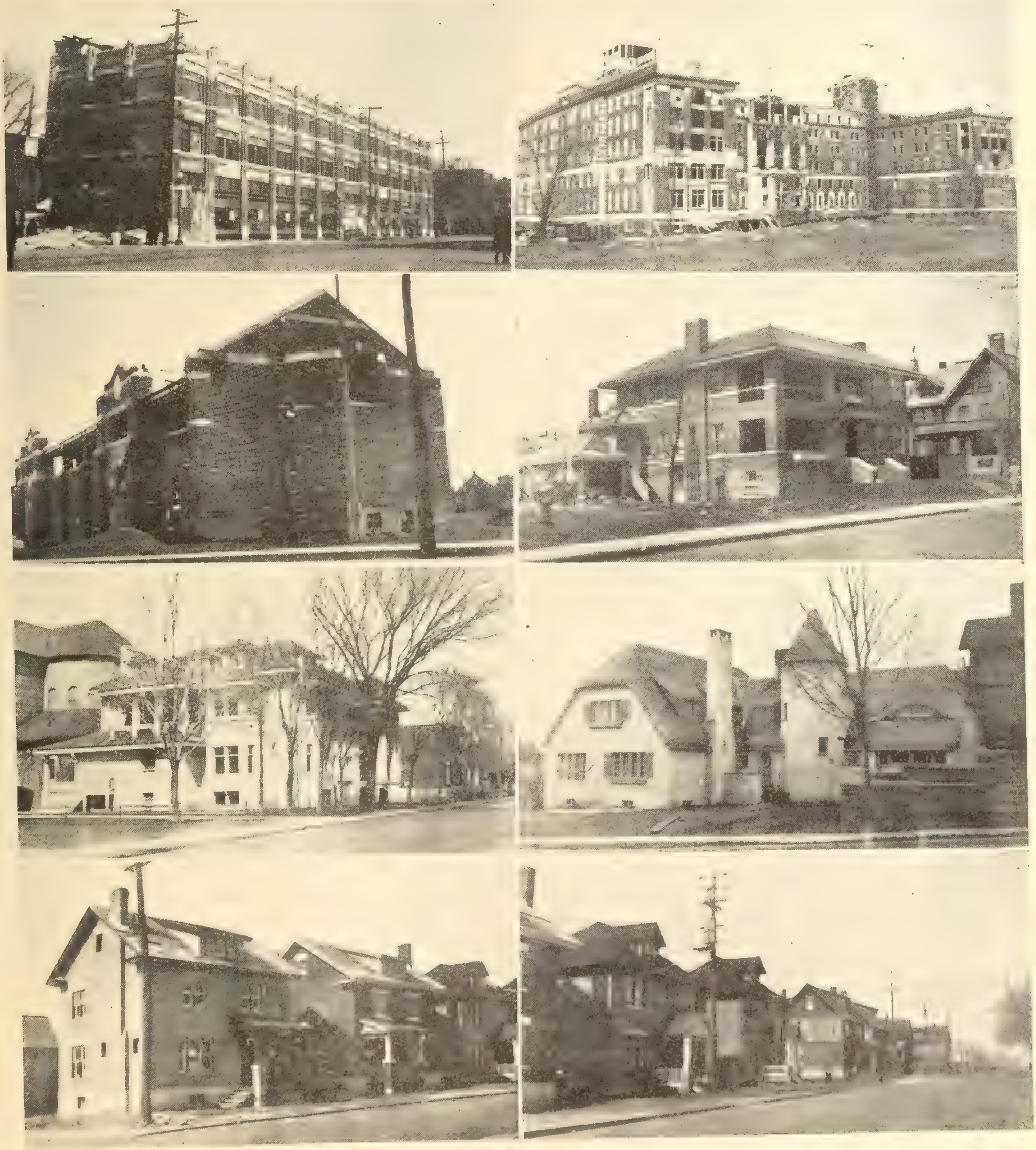
Safety on the Highways

In conclusion, I would urge the safe and sane use of all our roads. With improved surfaces and

(Continued on page 643)

Ottawa is an Active Building Centre

A Pictorial Review of Recent Construction



From left to right and top to bottom:—Departmental store in lower town; the Civic Hospital; Civic bath; cottage in Sandy Hill; residence in lower town; residence in Sandy Hill; cottages in lower town; lower town residences.

How Should Overhaul Quantities on a Grading Project be Computed?

Three Methods are Commonly Used, viz: 1. The Centre to Centre of Mass Method; 2. The Mass Diagram Method; 3. The Station to Station Method

The Last Scheme is Recommended as a Standard in a Report Made to the Associated General Contractors of America—The Requirements of a Standard Method of Determining Overhaul

The wide variation of results that may be obtained in computing overhaul quantities on a grading project, by the different methods of computation in use, has frequently entailed uncertainty or controversy over the payment for excavation. This variation, under certain conditions may amount to as much as 30 per cent., which on work of considerable magnitude introduces an error too great to be disregarded. As a consequence, in one instance the owner may be obliged to pay an excessive amount and in another the contractor may be underpaid for his work, while in either case there is an undesirable gamble. Since the actual overhaul is a definite quantity, though often not accurately determined, it appears advisable that some method, whichever is most suitable from the standpoint of accuracy and simplicity, should be adopted and used throughout the country. Such a standard employed by both the owner and the contractor, would undoubtedly prove advantageous to both parties concerned.

Standard Method of Computation

Opinions obtained from engineers and contractors in various sections of the country indicate that they are in common agreement as to what a standard method of computation should provide, but that some doubt exists as to which method actually gives the most satisfactory results. It is recognized, however, that any method selected as a standard should possess the following characteristics:

(1). Sufficient simplicity to be practically applied and generally understood.

(2). Accuracy commensurate with the usual practice of earthwork measurement.

(3). Minimum discrepancy for all of the variable conditions of cut and fill to be encountered.

(4). A definite free-haul limit.

(5). Susceptibility to clear wording in the contract.

Three Methods Compared

For the purpose of applying the test of these principles to several methods and showing some of the outstanding features of overhaul computation which will assist in the selection of a standard, the three methods most commonly used are herewith compared. These are commonly designated as:

1. The center to center of mass method.
2. The mass diagram method.
3. The station to station method.

The first is that method usually taught in university text books and in various field manuals; the second is a graphical method; and the third may be termed an arithmetical method, though all of them are derived from the theory of mechanics.

Four cases are here used to show how the variation by use of the different methods occurs. In each one a free-haul limit of 400 feet is assumed and no allowance is made for swell or shrinkage in the excavated material. Where it is desirable to allow for this, the proper percentage is added or deducted from the volume included between station points of the embankment.

Figure A-1 represents a hypothetical case of one extreme where the heaviest excavation and the deepest embankment are adjacent to the free haul limit. In this instance, the centre to centre of mass method

O V E R H A U L   C O M P U T A T I O N S

Station	Yardage	Station Overhauld	Overhaul Station Yardage	Station	Yardage	Station Overhauled	Overhaul Station Yardage
Figure A1 Station to Station Meth.				Figure A2 Station to Station Meth.			
0 to 1	4000	10.5	42000	0 to 1	20000	10.5	210000
1 2	4000	9.5	38000	1 to 2	20000	9.5	190000
2 3	4000	8.5	34000	2 to 3	20000	8.5	170000
3 4	4000	7.5	30000	3 to 4	20000	7.5	150000
4 5	4000	6.5	26000	4 to 5	20000	6.5	130000
5 6	4000	5.5	22000	5 to 6	4000	5.5	22000
6 7	20000	4.5	90000	6 to 7	4000	4.5	18000
7 8	20000	3.5	70000	7 to 8	4000	3.5	14000
8 9	20000	2.5	50000	8 to 9	4000	2.5	10000
9 10	20000	1.5	30000	9 to 10	4000	1.5	6000
10 11	20000	.5	10000	10 to 11	4000	5	2000
11 12	4000	(Free)0	0	11 to 12	4000	Free) 0	0
12 13	4000	(Free)0	0	12 to 13	4000	Free) 0	0
	132000		442000		132000		922000
13 26	Duplicate Figures		442000	13 26	Duplicate Figures		922000
		Total	884000			Total	1844000
Figure A1 Cent. to Cent. of M. Meth				Figure A2 Cent. to Cent. of M. Meth			
	124000	6.2 (10.2- 4)	768800		124000	15.8 (19.8- 4)	1959200
Figure B1 Station to Station Meth				Figure B2 Station to Station Meth			
0 to 1	550	11.5	6325	0 to 1	1950	11.5	22425
1 2	890	10.5	9345	1 2	4400	10.5	46200
2 3	1000	9.5	9500	2 3	5000	9.5	47500
3 4	1000	8.5	8500	3 4	5900	8.5	50150
4 5	1200	7.5	9000	4 5	6890	7.5	51675
5 6	1960	6.5	12740	5 6	5280	6.5	34320
6 7	3850	5.5	21175	6 7	6890	5.5	37895
7 8	4690	4.5	21105	7 8	5280	4.5	23760
8 9	5900	3.5	20650	8 9	1560	3.5	5460
9 10	6890	2.5	17225	9 10	700	2.5	1750
10 11	8690	1.5	13035	10 11	1560	1.5	2340
11 12	7530	.5	3730	11 12	840	.5	420
12 13	3130	(Free)0	0	12 13	680	(Free)0	0
13 14	200	(Free)0	0	13 14	600	(Free)0	0
14 15	300	(Free)0	0	14 15	410	(Free)0	0
15 16	3030	(Free)0	0	15 16	870	(Free)0	0
16 17	5880	.5	2940	16 17	535	.5	1070
17 18	13070	1.5	19605	17 18	1300	1.5	1950
18 19	8110	2.5	20275	18 19	1100	2.5	2750
19 20	4590	3.5	16065	19 20	1200	3.5	4200
20 21	3330	4.5	14985	20 21	1300	4.5	5850
21 22	2320	5.5	12760	21 22	1980	5.5	10890
22 23	1740	6.5	11310	22 23	5300	6.5	34450
23 24	1100	7.5	8250	23 24	7680	7.5	57600
24 25	1100	8.5	9350	24 25	9000	8.5	76500
25 26	1300	9.5	12350	25 26	7670	9.5	72865
26 27	980	10.5	10290	26 27	4600	10.5	48300
27 28	480	11.5	5520	27 28	2860	11.5	32890
28 29	200	12.5	2500	28 29	1190	12.5	14875
	95060		298590		95060		687590
Figure B1 Cent. to Cent of M. Meth				Figure B2 Cent to Cent of M. Meth.			
	44000	5.25 (925-400)	231000		46250	15.4 (19.4 -4)	712250

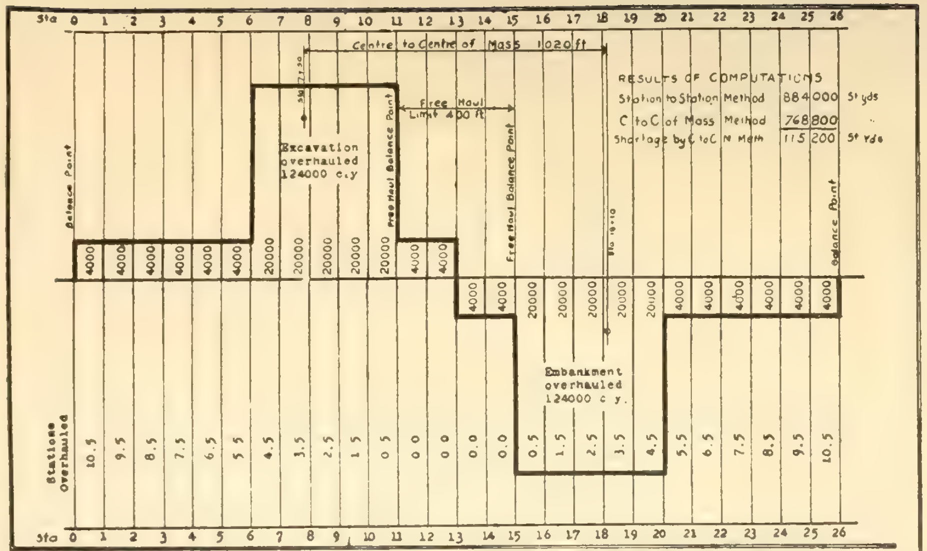


FIGURE A1-HYPOTHETICAL CASE SHOWING OVERHAUL CONDITIONS UNDER WHICH THE CENTRE TO CENTRE OF MASS METHOD OF COMPUTATION GIVES A LOWER STATION YARDAGE THAN THE STATION TO STATION METHOD. THIS RESULT OCCURS WHEN THE BULK OF BOTH CUT AND EMBANKMENT LIE CLOSE TO THE FREE HAUL LIMITS, OR STATED OTHERWISE, WHEN THE DISTANCE BETWEEN THE TWO CENTRES OF MASS IS LESS THAN THE DISTANCE BETWEEN THE CENTRE OF THE CUT AND THE CENTRE OF THE EMBANKMENT, DISREGARDING THAT PORTION WITHIN THE FREE HAUL.

WHEN THE CENTRE OF MASS OF THE EXCAVATION OVERHAULED COINCIDES WITH ITS CHAINAGE CENTRE POINT AND THE SAME CONDITION IS TRUE OF THE EMBANKMENT, THEN THE RESULT OBTAINED BY ONE OF THESE METHODS, IN THE HYPOTHETICAL CASE, IS THE SAME AS THAT OBTAINED BY THE OTHER

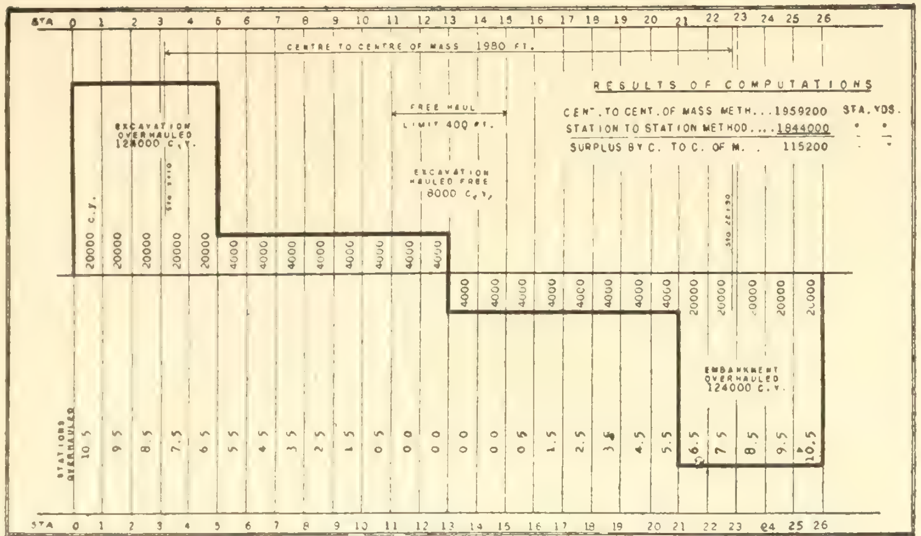


FIGURE A2-HYPOTHETICAL CASE SHOWING OVERHAUL CONDITIONS UNDER WHICH THE CENTRE TO CENTRE OF MASS METHOD GIVES A HIGHER STATION YARDAGE THAN THE STATION TO STATION METHOD. THIS RESULT OCCURS WHEN THE BULK OF THE CUT AND THE EMBANKMENT LIES CLOSE TO THE OUTSIDE BALANCE POINTS OR STATED OTHERWISE, WHEN THE DISTANCE BETWEEN THE TWO CENTRES OF MASS IS GREATER THAN THE DISTANCE BETWEEN THE CENTRE OF THE CUT AND THE CENTRE OF THE EMBANKMENT, DISREGARDING THAT PORTION WITHIN THE FREE HAUL LIMITS

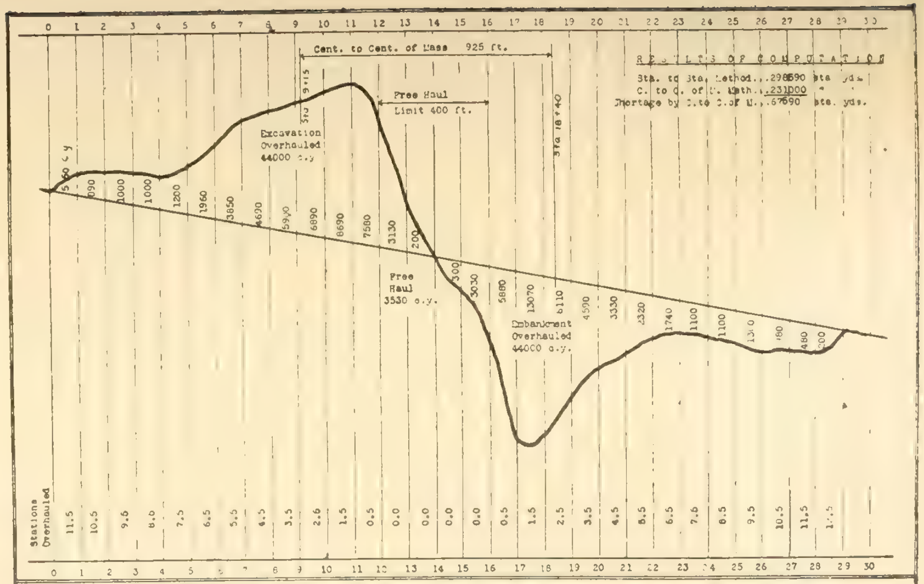


FIGURE B1 Showing conditions similar to those encountered in the field, under which the Centre to Centre of Mass method gives a lower station yardage than the Station to Station Method. As in the hypothetical case this occurs when the centres of mass of the embankment and the cut are relatively close together; with the deepest cut and fill near the free haul limits.

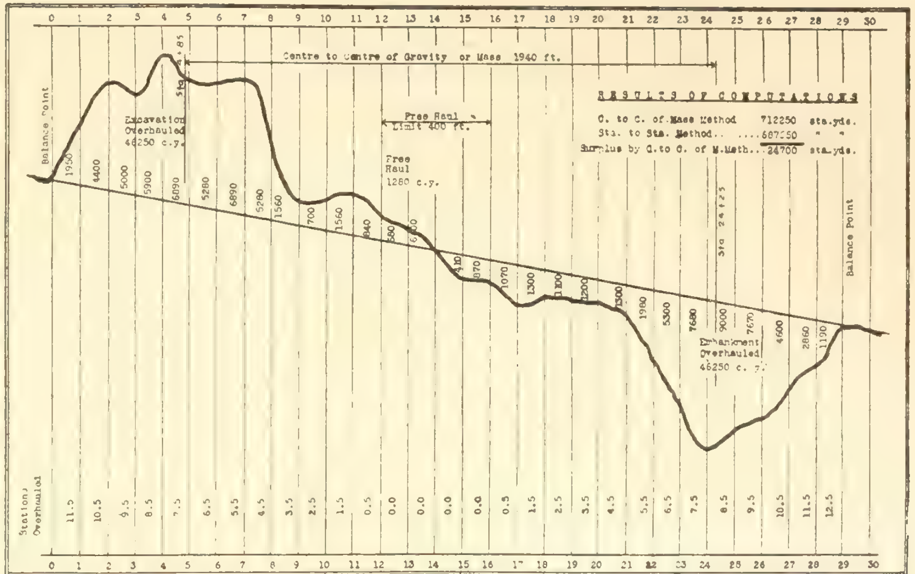


FIGURE B2 Showing conditions similar to those encountered in the field, under which the Centre to Centre of Mass Method gives a higher station yardage than the Station to Station Method. As in the hypothetical case A2, this occurs when the centres of mass of the embankment and the cut are relatively far apart, with the deepest cut and fill near to the balance points.

gives a station yardage 115,200 less than that obtained by the station to station method.

Figure A-2 represents a hypothetical case of the other extreme where the heavy cut is near one end of the section and the heavy fill is near the other end. In this instance, the centre to centre of mass method gives a station yardage 115,200 greater than that obtained by the station to station method. In both of these cases the amount of material moved is the same.

Figures B-1 and B-2 show similar results under assumed conditions approximating those encountered in the field. In B-1 the centre to centre of mass method gives 67,590 station yards less than the station to station method, while in B-2 it gives 24,700 more, indicating a greater variation of results by the former method.

Figure B-3 which is the mass diagram for figure B-1, shows results approximating those of the station to station method. It accomplishes graphically, what the station to station method does arithme-

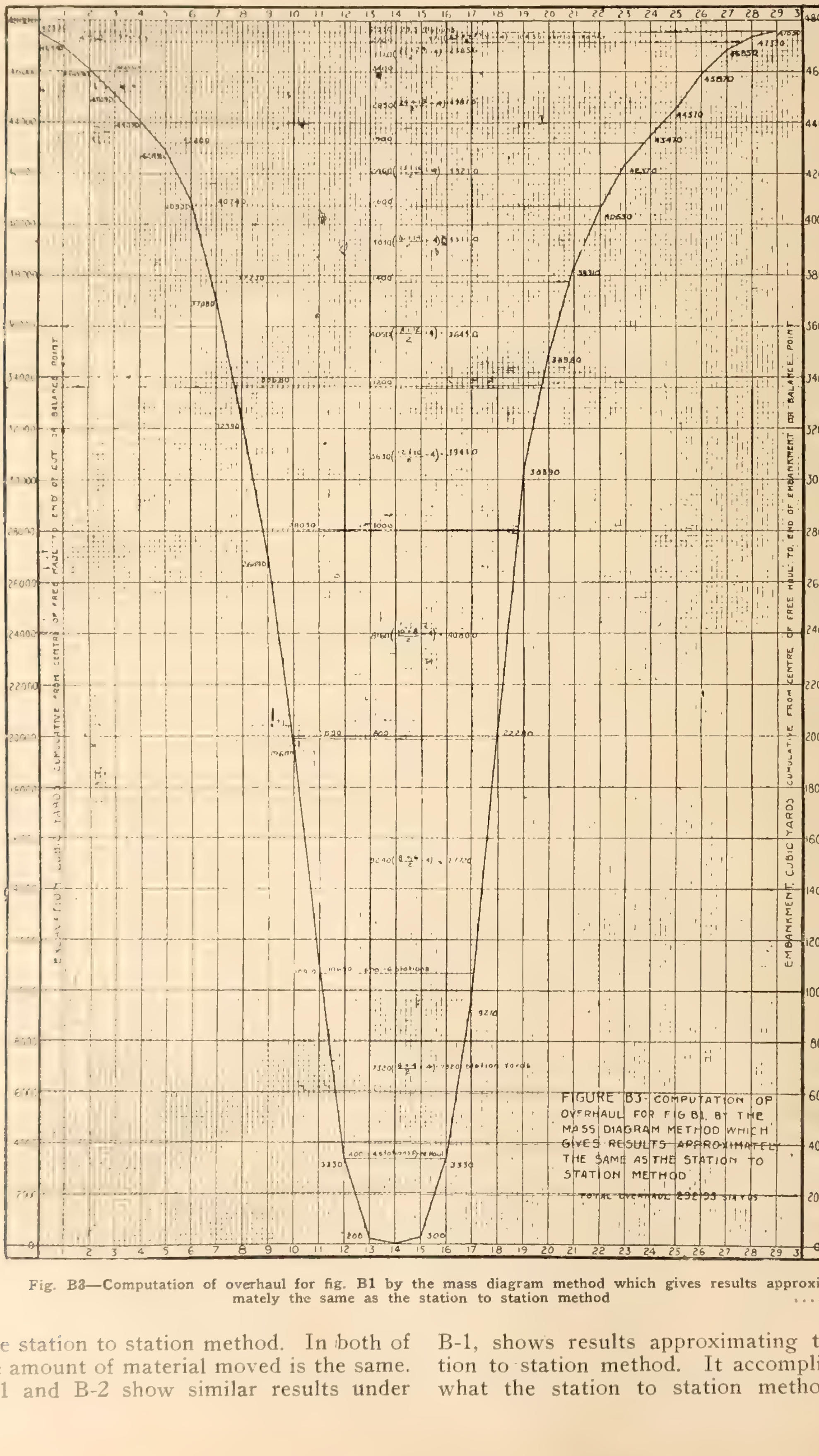


Fig. B3—Computation of overhaul for fig. B1 by the mass diagram method which gives results approximately the same as the station to station method

tically. The mass diagram, however, is subject to two objections: first, it presents the difficulty of plotting to contractors who are not familiar with such work; and second, on long shallow cuts and embankments considerable error may arise from discrepancies of plotting and scaling. The overhaul obtained by this method in case B-1 is 5,675 station yards less than that obtained by the station to station method but this discrepancy can be reduced by dividing the diagram into additional sections.

Conclusions

Without resort to a complete theoretical discussion of the three methods here shown, the essential features of each are indicated by the figures and the results of the computations. These may be summarized as follows:

1. The centre to centre of mass method fills all the requirements stated only under certain conditions, wherein the centre of mass lie relatively near to the chainage centre of the excavation to be overhauled and the embankment which it is to make. It introduces an error increasing as these centres of mass move relatively close together or far apart.

2. The mass diagram method can be made to meet the necessary requirements of accuracy by large scale and careful plotting, but it possesses the disadvantage of being difficult of understanding and uncertain to persons not familiar with plotting and graphical solutions.

3. The station to station method apparently meets all of the requirements satisfactorily and especially that of the point of accuracy under all variable conditions to be encountered.

The accuracy of the station to station method is derived from the fact that the excavation and enbankment quantities are treated in relatively small increments, by which procedure the overweighing of volumes and the discrepancies introduced by irregular contour are reduced to a minimum. This is an especially important consideration when the profile is very irregular. Almost any desired accuracy can be obtained by breaking stations to compute excessive humps or depressions.

Some objection might be raised to this method on the ground that the computations are somewhat longer than by the use of the others, but as these computations are all extremely simple this objection is believed to be overweighed by the advantages.

In view of the points here cited and the fact that the station to station method is quite generally used and understood by railroad contractors, many of whom are now doing highway work, it is recommended that an effort be made to establish this method as a standard for earth work measurements.

Economics of Culvert and Small Bridge Design

Comparison of the Cost and Merits of Different Types—How to Obtain Good Concrete—What Will be Bridge Requirements Twenty Years From Now?

By E. L. MILES*
County Engineer, Victoria County, Ont.

Water is by far the greatest enemy to road builders in the Province of Ontario, owing to the fact that our winters are severe, the spring run-off rapid, and our summer storms heavy. No matter how well the surface of the road is constructed for the traffic it is expected to serve if water is allowed to accumulate and soak into the road, or to run over it, the surface is bound to be injured by heavings, washings or softening.

With this positive knowledge at hand, there are at least three essential points to watch:

First—That the spring run off and summer storms shall be allowed to pass freely through the culverts.

Second—That the surface of the road should be well above the capillary attraction from ordinary water level in the ditches in the fall of the year.

Third—That the drainage from the surface of the road should be to the ditches and not allowed to stand and soak back into it.

Of these three points, the first is probably the most important.

Many land owners and a few road builders consider that the road ditches should be used as drainage canals, carrying water for long distances to definite outlets or bridges. The result is that snow and ice blockades cause the water to dam up and run over the surface as well as to soak into it. Efficient road drainage is as essential to road building as land drainage is to agriculture, and the water must be allowed to pass from one side of the road to the other as quickly and as often as possible, and thence away from the road altogether in its original and natural course.

Mr. E. L. Miles

Pipe Culverts

It is economy to place culverts in all runways, notwithstanding the fact that they may operate but once a year, and it is wise to adopt a policy of minimum size in order that their operation may be assured, and not always subject to ice and snow or grass and weed blockades.

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*At the tenth annual convention of the Canadian Good Roads Association, Hamilton, Ont.

There is but little value in an 8 or 10 inch pipe culvert either across the road or at farm crossings in the ditches. Twelve inch pipes might be used in ditches near the summit of the water shed, but 15 inch should be the minimum for ordinary cases. Eighteen inch should be the minimum across the road, and larger sizes used according to the acreage drained, and the slope of the land. The maximum pipe culvert should be 30 inch, limited because of the additional area obtained in the box type without extra expense. Headwalls should be constructed on all pipe culverts after the construction of the road, allowing the full standard width of road between them. Careful inspection of all pipe culverts should be made in the fall of the year in order to clear them of grass, weeds, driftwood, etc., and then again in the spring when the run off is taking place.

Of the second point, it might be said that if the road surface can be lifted away from the influence of capillary attraction there need be no worry from standing water in swamps or low lands. Three feet above ordinary water level in such cases is usually sufficient.

Of the third point, it might be said that the ruling crown of roads built for fast and frequent traffic will not effectively discharge the water from the clay or gravel shoulders, and therefore the shoulder should be crossed at regular intervals of not less than 50 ft. by stone drains, these drains being so constructed as to allow efficient drainage a few inches below the metalled or paved portion of the driveway. The water will then run along the edge of the pavement to the drains and thence to the ditches without soaking under it.

Comparative Costs of Laying Pipe

Perhaps at this juncture, it would be interesting to note the cost of laying concrete or clay pipe and metal pipe. We shall assume that it is necessary to lay all concrete or clay pipes in a concrete casing in order that safety from collapse shall be assured against heavy traffic, and also that metal pipe when galvanized and corrugated can be laid without assuming this risk.

Engineering as a science has not yet reached that state of perfection whereby its members can write specifications, or make surveys, or draw plans so that the last word in efficiency is taken up. The best methods do not call for this high state of perfection, but rather that the work shall be so designed as to allow for changes as the work progresses.

Changes, interchanges and transportation are the three essential points of pipe culvert construction as applied to road building. County and township superintendents are constantly installing new culverts and replacing old ones, and they are not always able to place the new culvert in its final position before the road is constructed. As no concrete or clay culvert pipe should be placed across any road without being encased in 6 inches of concrete, the factor of "change" is therefore cut out. To change such a culvert means to destroy it entirely. So also is the factor of interchange cut out—a most desirable privilege for all engineers.

Then transportation means that a 2 ton truck box at 74" x 120" can handle twenty 15", fifteen 18" or eight 24" concrete or clay pipe without stacking or crowding. An 18" culvert, 30' long, requires 12 lengths of 2½' pipe, or a truck load is 1¼ culverts, whereas the same truck will carry 7 metal pipe culverts for the same cost without any risk of breakage.

From this information we might make up a table using the standard prices for both classes of pipe, and we will find that corrugated iron pipe is 62½% cheaper to lay than concrete or clay pipe.

Now comes the big question of "life" of the two materials. We all recognize that concrete if properly placed is life lasting if not permanent, and as it is placed beneath the road surface and not subject to wear, it is under ideal conditions. Iron pipe culvert records do not appear to extend beyond 25 years, but we have no information at hand to show collapse even at that date. An article written by a well known engineer during the summer of 1922 on the subject "How Long is . . . . Permanent" may give some light on the subject. He states that the word "permanent" has come to have a rather elastic meaning. The item of strength is sufficient in both cases, if the concrete or clay pipe is embedded in concrete.

Box Culverts and Small Bridges

The ruling of the department of highways for the province of Ontario with regard to the designation of bridges is determined by the width of the span in feet, and all structures measuring ten feet and over come under this category, and are subject to the approval of the department in all particulars. Under this heading, box culverts having a less span than ten feet might also be classed.

In both cases, the construction is usually of monolithic concrete, and the engineer naturally finds himself subject to two great factors which affect his success: (1). Suitable material and (2). Efficient labor.

Specifications have been written by eminent engineers specifying the last word of efficiency in the use of the materials, but when they are applied to the work, it is found that the cost of obtaining that efficiency is prohibitive, and the result is that we do the best we can with the materials at hand.

Gravel is the principal material used for such work, and almost every pit is graded differently. To get the greatest efficiency from the gravel as we find it, a few simple field tests should be made as follows: (a) Vegetation, (b) silt, (c) coarse aggregate and (d) voids.

Vegetation can be seen by careful examination, or by washing the material in a bottle. Silt can be measured by washing in a bottle and allowing the mixture to settle. It should not be more than 3%. Coarse aggregate should be over one-half of the total material retained on a quarter inch mesh screen. The proportion of water that can be poured into a given quantity of gravel will equal the proportion of cement required.

The proper quantity of water is measured by the slump test. That is, a column of fresh concrete should retain its shape when turned out of a cone and not run or settle down in a shapeless mass. For the foundation work, it should not settle more than 12% and for reinforced concrete not more than 20.8%.

Obtaining Good Concrete

Tamping and spading is a great factor in securing good concrete, and this should be done as much as possible while it is being deposited in the forms. Not only are all the air bubbles removed, but the concrete surface shows the results when the forms are taken off, and much less rubbing and plastering is required.

In the construction of all beams, floors and head walls, it is considered safe, sane and economical practice to wash the gravel, that is, to run it through the mixer just prior to use, and to pour off the dirty water.

The factor of efficient labor is always annoying. So few realize their success or failure until after the work is complete. One set of instructions is sufficient for every job they do no matter under what conditions, but it is helpful to them if they are asked to make a slab of concrete from the materials they intend to use before they actually place it in the work. They are usually good judges of good and bad concrete after it has set up.

With regard to the foundations for small bridges it is of course essential that a secure bottom shall be found, and in most cases this is not difficult. In swamps, however, where the stream is winding and sluggish, it so happens that considerable depths of muck and soft clay are encountered. In these cases, it is not essential to reach the bottom of the muck with the concrete, but instead, a pile foundation can be driven, using a follow block so that the head of the pile will be three or four feet down in the muck. Then by driving a wakefield piling to act as forms, the muck can be pumped out of the depth required, and the concrete placed a foot or so below the top of the piles and brought to a point about 6 inches above water level. On top of these foundations the bridge can be constructed without danger of settlement or collapse.

Concrete can be successfully poured under water by using a little care. A very good method is to pipe it through the water, keeping the pipe always filled above the water line and by moving it around on the bottom so as to let the concrete out. After the bottom course of about 8 inches has been placed, the forms can be pumped out and the concrete continued under ordinary conditions.

Reinforcing in concrete culverts and bridges is placed mainly as a strengthener for good concrete, but it should also be placed as insurance against poor workmanship, such as in wing walls where no load is to be carried.

Will Present Bridges Last

In conclusion I would suggest that every concrete structure should bear a date stamp such as "1923" in some conspicuous place along the coping wall. It will be interesting for the future generations to note two features: First, the conditions of the concrete according to its age and second, the wisdom and foresight of the present day designers. Already we are blasting out narrow concrete culverts that were erected as "permanent" structures ten years ago. In some cases the concrete is too poor to even use in a foundation of a new structure.

What will happen in 1933 or 1943? Will our 20 ft. roadway structure be adequate for the demands of the traffic? I think not. Will they find the structures of suitable construction to provide for additional width of roadway? I am afraid not. The old structure will have to be destroyed and a new one built, unless we get away from the class of permanent structure that we are now building. The fact that 90% of the total output of motor cars for the year 1922 were sold up to May 1st 1923 gives us an idea of the rapid increase in the number of vehicles that is going on, the huge amount invested in them, and the duty that falls upon us to provide trackage for this modern method of transportation.

Maintenance of Macadam Roads in Michigan

By L. H. NEILSON
Deputy State Highway Commissioner, Michigan

While gravel is quite generally distributed throughout the state there are some localities where broken stone is more easily obtained and in certain counties considerable mileage of waterbound macadam roads have been built mainly of crushed limestone. These were very satisfactory in the days of iron tired traffic vehicles. The advent of large numbers of fast moving pneumatic tired motor vehicles soon caused the surfaces to ravel due to the horizontal thrust of the wheels and to the fact that the suction of the rapidly moving vehicles sucked out the dust and fine stone and blew it off the road. In order to preserve the surface and retain these in the road, it became necessary to apply something to hold them there.

In a few instances good success has been secured by using calcium chloride and limestone screenings. In most cases bituminous material of a consistency that would permit of application with little or no heating has been found most satisfactory.

Under modern traffic conditions it is very unusual to find waterbound macadam roads built without the idea of applying some bituminous material just as soon after construction as the surface is fit. This usually takes from one to six months, depending on the season of the year and the amount of traffic.

In order to get the best results the macadam surface must be swept clean of all loose material, such as dust, screenings, earth, etc. The larger stone in the top course should show as a mosaic surface. If the screenings between the individual pieces of rock are swept a little below the top surface a better bond is secured. Especial attention should be given to cleaning the edges. All holes and ruts should be filled with stone well tamped in, or better still with larger stone mixed with "cold patch" material and seasoned before being placed in the depression. After the cross section has been as fully restored as is practicable and the surface carefully cleaned, the bituminous material is applied with a pressure distributor, preferably motor driven. The amount of material to be placed depends entirely on the condition of the surface. For initial treatments the usual amount would be ½ gallon per square yard applied in two ¼ gallon treatments. The first or priming treatment must be allowed to penetrate several hours before the second treatment is applied. Immediately following the second treatment, gravel, broken stone or slag ranging from ⅛ to ¼ inch in size is spread uniformly in sufficient amount to entirely cover the fresh tar or asphalt and blot up any material that might tend to run off the surface. This is spread by hand from an end dumping truck or from a converted manure spreader.

There seems to be no decided advantage in the use of tar or asphalt of the proper consistency for cold application except that the tar does not harden as quickly as the asphalt does. For that reason a better penetration is secured using tar for the priming coat of the initial treatment.

Load Tests of 6-foot Segment Block Sewer

Action of Ferguson Block Under Load was Determined by an Experiment Recently Carried Out—Failure Took Place Under a Load of 3000 lbs. per Square Foot

There has been recently completed an interesting test on a section of 6 ft. diameter sewer built of Ferguson segment block as manufactured by Dominion Sewer Pipe and Clay Industries Ltd. From the illustration the details of this type of block may be observed. The test was conducted by C. A. Hughes, M.A.Sc., of the Department of Applied Mechanics and Civil Engineers of the University of Toronto. The following are the particulars of the sewer under test:

Length of section, 6 feet 10 inches. (irregular ends)
Internal diameter, 6 feet.
External diameter, 7 feet 2½ inches
Ring thickness, 7¼ inches.
Number of blocks to circle, 24.

Dimensions of outer block, Width, 9-5/16 in., thickness, 6 in.; length, 18 in.; weight 49½ lbs.

Dimensions of inner lining, Width 9-1/4 in.; thickness, 1 in.; length, 18 in.; weight 17½ lbs.

Total weight of complete ring, approximately 1,056 lbs. Mortar, one part of portland cement with about 10 per cent of hydrated lime added and three parts of sand. Foundation.—In sandy loam; upper half of section constructed above ground. Date of construction—May 3rd and 4th, 1923. Loading commenced May 22, 1923.

Method of Testing

The load was applied on a sand bearing covering an area of 25 square feet, 6 feet over the internal diameter and 4 feet 2 inches in length on centre of the section. The minimum thickness of sand was 15 inches. The sand was confined within a crib so that no timber touched the segment blocks, clay being packed around the edges. From the edge of the sand bearing to the point where the arch had support in the soil was approximately 2 feet 3 inches measured on the circumference or equivalent to three blocks in width of each side without any outside support.

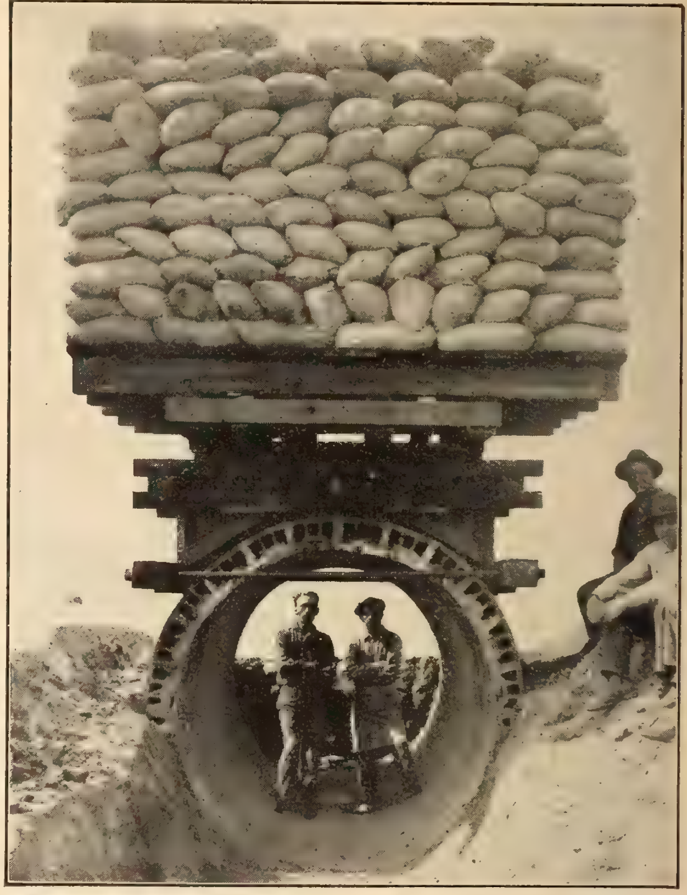
The sand bearing was covered with 2 inch fir planks on which 6"x8" fir timbers 10 feet long were crossed, carrying a platform 10 feet square on which the test load was applied by means of sand in sacks and loose, all of which was weighed. The weight of the sand bearing and timber cradle and loading platform was approximately 7,500 lbs.

Measurement of Deflection Under Load

During the test measurements were taken at three horizontal and three vertical points, internal diameter being measured in each case. Measurements numbered 1, 2, and 3 were vertical measurements, while 4, 5 and 6 were horizontal. Nos. 2 and 6 were taken directly under the centre of the load while the others were measured at the ends of the section. The change in dimensions and the dates when measurements were taken are recorded in the table.

The first measurements taken before the load was applied on May 22nd, are the original measurements. The second measurements were taken on May 26th, with a total load of 32,000 lbs., and the most marked change was at point No. 1, which would indicate that owing to this being an outside block it had not keyed tightly when the centreing was removed. On May 28th the load had been increased to 50,000 lbs., and the third set of measurements were taken, these being checked under the same load on May 29th and 31st.

When a load of approximately 40,000 lbs. had been applied the first movement was detected and at 50,000 lbs. on May 28th a slight fracture showed in one of the webs of the upper block and the mortar joint of the upper tile lining opened slightly. With a constant load of 50,000 lbs. a slight opening of the outside joints of the outer blocks half way down the arch appeared.


A 72-in. diam. test section of Ferguson segment block construction carrying a load of 2550 lbs. per sq. ft. with sides of arch unsupported

Between June 2nd and June 7th, 2.33 inches of rain fell which increased the load by an unknown quantity by saturation and also softened the foundation and edges of the trench. The final measurement was taken on June 7th and showed a movement under these severe conditions of about one sixteenth of an inch.

During the week of June 11th the load was increased to 63,000 lbs. or over 2,,500 lbs. per square foot. Under this load mortar joints opened a little wider but no breakage occurred in the tiles nor did any inner tile lining drop out of place.

On June 19th the load was increased to 75,000 lbs. or 3,000 lbs. per square foot, on the loading area.

Measurement of Deflection Under Load

		Load Date	0 May 22	32,000 May 26	50,000 May 28	50,000 May 29	50,000 May 31	50,000 June 7
Measurements	Vert	1	6'-2 12/16"	6'-2 7/16"	6'-2 5/16"	6'-2 5/16"	6'-2 5/16"	6'-2 5/16"
		2	6'-2 10/16"	6'-2 10/16"	6'-2 7/16"	6'-2 7/16"	6'-2 7/16"	6'-2 6/16"
		3	6'-2 5/16"	6'-2 5/16"	6'-2 3/16"	6'-2 3/16"	6'-2 3/16"	6'-2 2/16"
	Horiz	4	6'-0 5/16"	6'-0 7/16"	6'-0 8/16"	6'-0 9/16"	6'-0 8/16"	6'-0 9/16"
		5	6'-0 5/16"	6'-0 6/16"	6'-0 7/16"	6'-0 7/16"	6'-0 7/16"	6'-0 8/16"
		6	5'-11 15/16"	5'-11 15/16"	6'-0"	6'-0"	6'-0 1/16"	6'-0 1/16"

Loading was completed at 3 p.m. on the 19th and at 4 p.m. the sewer collapsed.

The section was thus under load for 28 days before it collapsed.

The test was made primarily for the information of the city engineer's department, Toronto, and engineers of the sewer section inspected the construction whilst in progress, and whilst under test. At their request a two brick sewer corresponding to the type built in Toronto of the same diameter as the segment block sewer (72 inches) has been constructed and is to be loaded and tested in the same manner to obtain comparative data.

All arrangements for the test were made under the supervision of Mr. A. G. Dalzell, consulting engineer to the Dominion Sewer Pipe & Clay Industries Limited.

Cement Joints for Force Mains

Method and Cost of Construction at Winchester, Ky., Given in Paper Before New England Water Works Association

By WILLIAM WHEELER
Consulting Engineer, Boston, Mass.

The Winchester Water Works Co. owns and operates the plant which supplies Winchester, Ky., and its vicinity. The water is filtered by the rapid or American system, and pumped by two compound Duplex pumping engines of 1 m.g.d. capacity (for alternate service) through a cast-iron force main (originally 10-in.) to the grid of distribution mains, and thence through it by 10-in. and 12-in. mains to a wrought-iron standpipe, 75 ft. high, having its base at about elevation 1,033 ft. above tide water, and 275 ft. above the clear water basin at the pumping station, making an ordinary pumping lift of about 120 lb., plus friction in the mains; and 25 to 35 lb. more during pumping for fire service.

Acute shortages of water supply from the creek and reservoirs occurring in the autumns of the dry years 1913, 1918 and 1921, determined the necessity of getting a supplementary supply from the river, preferably at a point about 4.30 miles farther southwest of the present station, near Government Dam and Lock No. 10; and with the ultimate purpose of establishing there, permanent works adequate for supplying all future requirements of the city and its vicinity. The primary steps adopted for immediate action were:

Stages of the Work

First. To take up the 10-in. pipe of the original force-main—a half-mile of which has been paralleled with 12-in. in 1906, and replace it with 12-in. pipe. This work was done in six stages or construction sections. Starting at the lower end of the work, at the point to which 12-in. pipe had been laid in 1906, 10-in. spiral rivetted steel pipe was used for by-pass lines where necessary, connected through suitable fittings with the 12-in. substituted pipe and the old 10-in. pipe to be taken up, whereby the supply was maintained while the successive sections of old and new pipe were progressively taken out and replaced.

The spiral-rivetted pipe and fittings were furnished by the American Spiral Rivetted Pipe Works. Most of the work was done between Aug. 1 and Dec. 31, 1921, and it was substantially finished in May, 1922. This main is referred to as "Force-main No. 1."

Second. The next step was the installation of a force-main of cast-iron pipe from the Kentucky River to the supplying works at the pumping station. For this purpose the 10-in. pipe taken up from the original force-main to the city, was used as far as it would go toward the river; and from thence to a tentative site for temporary or emergency connection with the river, 12-in. pipe was used, save for about 515 ft. of spiral rivetted steel pipe used as a temporary space filler, making a total length of 22,210 ft.

It will be understood that this combination of kinds and sizes was required to meet immediate emergency needs, and with the intent to either replace or duplicate the 10-in. with mains of larger size, as future need and conditions may require. The work on this main continued from May 23 to Dec. 5, 1922; and it will be referred to as "Force-main No. 2." Under present conditions it will be used to furnish emergency supply to supplement that from Howard Creek; and will operate under a maximum head of about 400 ft. static, plus friction head. Under direct pumping from the river to the city distributing system, with a standpipe full—should such service ever be required—the maximum would reach about 523 ft. static, plus friction. Such use, however, is not likely to occur under the most effective and economic plan for design and operation of permanent works.

After completion, this line was tested under a maximum head of 225 lb., or 523 ft. static, at its lowest point; and about 105 lb. or 243 ft. at its high points.

The work was done under the general supervision of C. F. Attersall, superintendent of the works, co-operating with J. M. Cashman, having immediate charge of the field work.

Joints of Portland Cement

The joints were made with neat portland cement, moistened and mixed with water in the ratio of 1 lb. of water to 13.5 lb. of cement. The average weight of cement used per joint, including waste and loss, was:

For 12-in. joints, 8.3 lb. per joint.
For 10-in. joints, 6.9 lb. per joint

The percentage of water to cement was 7.4.

The cement was mixed in batches of the unit quantities, with water in the ratio above stated, in a galvanized iron pail, and thoroughly stirred by trowel and by hand, using rubber gloves to protect the mixer's hands while kneading it and breaking up the small lumps of cement in the process. It was then carried by the mixer and dumped into a pail of the same sort, one for each cement calker, of whom there were usually three in a gang.

Meanwhile the pipes have been aligned and adjusted at the joints, yarned with dry jute packing, and thoroughly calked in the usual manner by the yarn calker, so as to leave 2½ in. or more for the depth of the cement joint. Then a cement joint maker and calker spreads across the trench under the joint, a piece of rubber or oilcloth, about 2 ft. wide by 3 ft. long, to catch any cement that may drop in making the joint, and places his pail of mixed cement on the spigot end of the pipe before him, as he straddles the socket end of the connecting pipe; and with rubber gloves on, he fills the joint with cement as full as he can by hand and with the calking iron, rams it into the joint as hard as he can without using the hammer. This operation by hand is repeated four to six times, the hammer being used, however, after each filling of the joint except the first, the cement being thereby calked and driven under the blows of a 3½-lb. hammer as thoroughly as in calking a lead joint, until little or no impression is made upon the face of the joint.

As soon as the joint is finished, the calker removes any dirt or foreign matter that may have fallen upon the cloth, dumps into his pail any cement dropped upon it while making the joint, and moves on to his next one.

The average time of so making either a 10-in. or a 12-in. joint was about 25 minutes, including moving from one joint to another. The time used in making 10-in. joints was increased somewhat because of the greater variation in depths and thicknesses of the joint space, than of the 12-in. pipe.

After the calker passes on from a calked joint to his next one, the mixer fills the trench with earth sufficiently to cover the calked joint to a minimum depth of about 6 to 8 in., in order to retain the moisture in the cement while it is setting.

The Gang of Joint Makers

In making up the joints it was found most effective to use a gang of five men, as follows:

(a) One man to do all the mixing of cement; pass and distribute it to the cement calkers; and to cover the joint with earth (to retain moisture) immediately after it has been calked.

The mixer was paid at the rate of 25 ct. per hour.

(b) One man to align and center the pipe at its joints, and yarn them; and, if time allows, then to help out the three cement joint makers and calkers.

The yarner was paid 27½ ct. per hour

(c) Three men, working solely at making and calking the cement joints during such times as joint making was going on. When not employed in joint making these men were used on other work to the best advantage, according to their fitness and capacity therein, such as trenching, rock work, pipe laying, back filling, etc.

Cement joint makers and calkers were paid 27½ ct. per hour.

Such a gang of five men was under the direction and oversight of a foreman, having general charge of the work on the pipe line; and foremen were paid 35 ct. per hour.

The tool end of the blades of the calking irons are about 4½ in. long and 1¾ in. wide, with tranverse sections conforming to the outside of the pipe on which they are to be used. These were provided in four different thicknesses, of about ¼ in., ⅜ in., ½ in. and ⅝ in., respectively, for use according to the range of thickness of the annular joint spaces. The calking end of the blade should be well squared, so as to maintain its full end-face area for effective bearing on the joint.

Cost of Materials and Joints

In making up the cost of the joints, the labor costs are computed at the wage rates above stated, and 3 per cent. added for liability insurance. The unit costs of materials and supplies used, delivered at the trench, were:

Cement at 57 ct. per bag, net.

Jute yarn at 6¾ ct. per pound.

Rubber gloves at a total cost of $53.50, distributed on the number of joints entering into the estimate, with gloves enough left to complete the work, or use elsewhere.

Calking tools, special work, at 1 ct. per joint.

The cost per joint for labor and materials was as follows:

	(New) 12 in.	(Old) 10 in.
Labor:		
Foreman	$0.05	$0.05
Yarner	.03	.03
Mixer	.10	.10
Calker	.12	.12
Liability insurance, 3%	.01	.01
Total labor	$0.31	$0.31
Materials:		
Yarn	$0.023	$0.019
Cement	.070	.060
Rubber gloves	.014	.012
Special calking tools	.010	.010
Total materials	$0.12	$0.10
Total labor and materials	$0.43	$0.41

Measuring Joint Leakage

Each section of force-main No. 1 was plugged at both ends before turning the water into it. A ¾-in. tap was then made into the adjacent end of the section previously laid and already under pressure; and another ¾ in. tap into the section to be tested, and these taps were joined through a ¾-in. connecting pipe, on which a ⅝-in. Trident meter was installed. After the reading of the meter was recorded, the water was turned on and the section of pipe to be tested was filled. When the meter stopped, showing the pipe line to be full, the meter was again read—the difference between these two meter readings showing how much water was used for filling the section. The section under test was then kept under pressure from 5.5 hours as a minimum, up to 50.5 hours, depending upon the time that could be allowed therefor before putting the particular section under test into service. At the end of that time another reading was taken, whereby the leakage during the test was determined. While the test was going on, the engineer and his assistants removed the earth from the joints and inspected them for any visible evidence of leakage.

Out of the 196 joints in the first section tested, seven showed efflorescence shortly after the main was full, the face of these joints being moist with a white frothy exudation. On rubbing one's finger over these joints, the exudation disappeared and did not show up again, although the joint remained moist for as long as 12 hours, after which it usually dried out and no further moisture appeared. Where such white foam was not rubbed off, it dried and left a whitish coating, such as often appears on the surface of recently-laid cement work.

The other sections of force-main No. 1 were tested in the same way, and showed substantially the same conditions at the joints. The several tests were made under minimum pressures ranging from zero to 125 lb. and maximum pressures from 65 to 160 lb. per square inch. The elapsed time between making the last joint of each section and first turning on the water for testing it ranged from 20 hours to 40 hours and averaged 29.3 hours. The last joints of the several sections were finished in the following months, respectively, namely: section 1 in October, section 2 in November, sections 3 and 4 in December, 1921; and sections 5 and 6 in May, 1922.

Amount of Leakage

The weighted average leakage per foot of joint, in all tests of the sections of force-main No. 1—omitting the tests in which some leakage occurred elsewhere than at the joints—was at the rate of 0.50 gal. per day, as registered by the meter.

Force-main No. 2, laid in 1922, was tested only in small part by sections. In one of the sections there was leakage by a cracked pipe, and in others at gate-valve stuffing boxes. These were repaired and the force-main completed late in November; and in December, 16 days after the last joints were made, the entire force-main, 22,210 ft. in length, was subjected to test. This length comprised 2,898 ft. of 12-in., and 18,797 ft. of 10-in. cast-iron pipe, having 2,115 joints, and 515 ft. of 10-in. spiral-rivetted galvanized pipe, having 18 joints with rubber gaskets—used as a temporary space filler. This test continued 117.5 hours, under pressure of about 105 lb. per square inch along its higher levels, and 225 lb. at its lower levels. The weighted average leakage for all the joints as registered by the meter, was at the rate of 0.38 gal. per day per foot of cement joint—upon the assumption that no leakage occurred at the joints of the spiral-rivetted pipe—which assumption, however, was not strictly true.

Reconstruction of T. Eaton Store

(Continued from page 625)

leg derrick as well as a guy derrick in the southerly half of the building were employed.

Meantime the general masonry contractors, Thomson Bros., were busily engaged on the floors, brick work, and excavating the double basement. This excavation had to be carried out with horse-drawn wagons, taken into the basement of the old store by an elevator, and filled from a chute at the junction line between the new and old building. Provision was made for only a narrow passage through the store sub-basement for these wagons, and the retail business of the basement was carried on as usual behind the partitions.

At night trucks were allowed to come up the Yonge St. frontage, and it was during the night that most of the excavation work was accomplished without in any way interfering with the heavy traffic of Yonge Street during the day.

In the meantime, the basement of the second section immediately west of the first was separated from the rest of the building by hoarding and the foundation work carried out in the manner described above, except that in this case no steel columns or beams were erected until the demolition of the old building. For demolition and erection of steel, two stiff-leg derricks were set facing west at the top of the already completed steel framework.

The remaining sections of the building were reconstructed in the same way. The result of this sequence of operations has been very speedy construction which has enabled the first section of the store to be opened to public use before the last section was started.

As soon as any of the steel was erected, the fireproofing was set in place and the floor slabs poured. Construction efforts were thus centred on a comparatively small section with the result that very great speed was made, the entire construction force then moving progressively, completing each section in turn.

The architects for the reconstruction were Sproatt and Rolph, Toronto, represented on the job by Mr. G. Evans.

The general contractors for the job are the Construction Department of the T. Eaton Co. Ltd., Mr. Geo. Thompson being engineer in charge. Thomson Bros., Ryrie Building, Toronto, are the masonry contractors and McGregor & McIntyre Ltd., 1139 Shaw St., are supplying and erecting the structural steel. The hollow tile fireproofing is being supplied by the National Fireproofing Company of Canada, Dominion Bank Bldg. A. D. Grant, 53 High Park Ave., handled the plastering, while George Oakley & Son. Ltd., Booth Ave., Toronto, supplied and laid the Travertine flooring. The architectural bronze will be supplied by the Dominion Bronze & Iron Co. Ltd., Winnipeg, represented by H. A. J. Aldington, 53 Yonge St. Arcade, Toronto). Bronze windows and show cases in the concourse will be furnished by Robert W. Mitchell Co. Montreal. The sash are being supplied by Fireproof Door Co., Cherry St., and fire doors and part of the cornice by A. B. Ormsby Co., Abel St. W. E. Dillon & Co. Ltd., 187 George St., is also supplying cornice. W. A. Moffatt Co. is furnishing the roofing; A. W. Carmichael Ltd., the composition flooring; Pilkington Bros., the glass and Thompson Monument Co., the granite. The brick is being supplied by the Don Valley Brick Works and Price Bros. The electric hoists for the derricks were furnished by the Marsh Engineering Works, Belleville, Ont., through the firm of Mussens Limited. Elevators will be supplied by the Turnbull Elevator Co. All Addresses are Toronto unless otherwise indicated.

Services that Provincial Highways Render

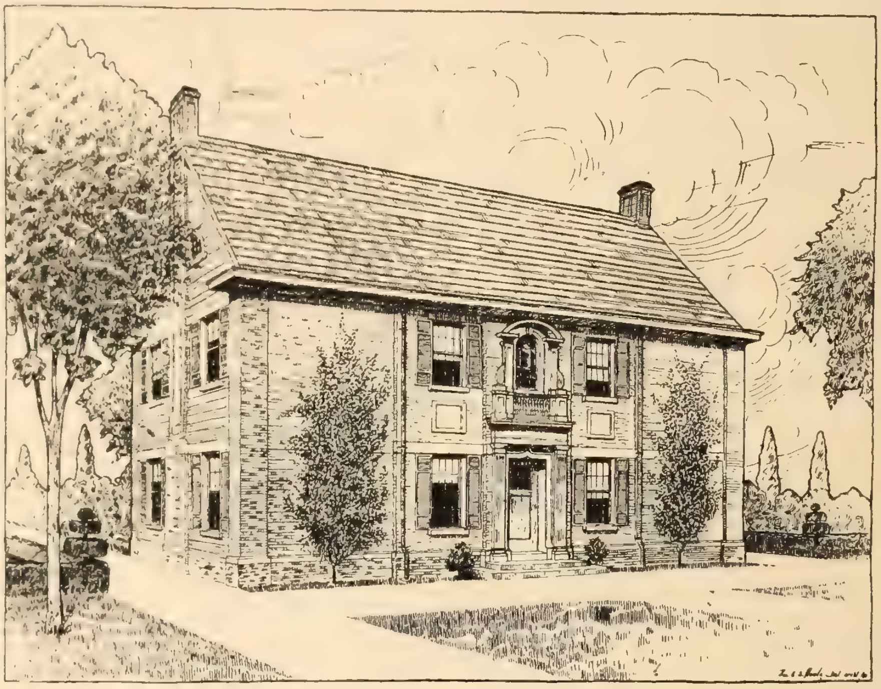
(Continued from page 632)

heavier traffic the number of fatal accidents caused by speed and carelessness is increasing alarmingly.

The safety of the public on the highways is one with which we are all concerned and one of the most dangerous death traps we have to deal with is the railway grade crossing. Each year many people are killed and great damage done to vehicles by accidents at crossings. To avoid such dangers, notice boards are being placed on the highways about three hundred feet on each side of the railway crossing so that drivers may have warning when approaching a track. While such notice boards serve as warning to the careful driver they are disregarded by the careless, in many cases with fatal results.

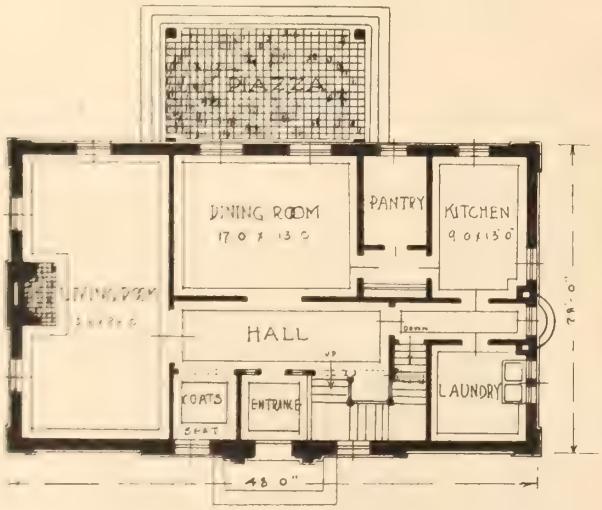
The Contract Record's

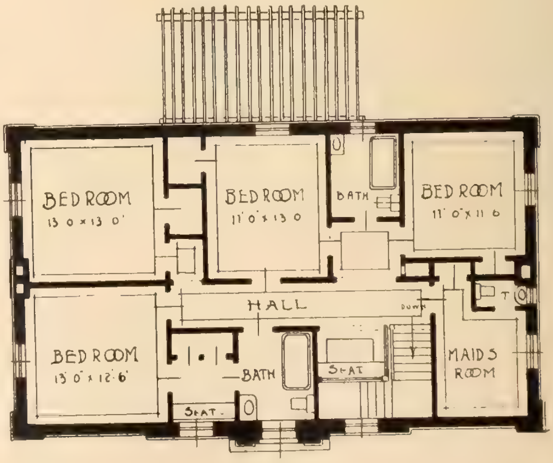
Weekly House Suggestion No. 73



The house illustrated and described in this article was built in one of the suburban residential districts of Montreal and was designed by Mr. J. A. S. Houle, architect of that city.

Its design is along the lines of the "English Renaissance." This house, which was built at the cost of $20,000, measures 48 ft. by 28 ft. and rests on concrete foundations. The exterior walls are solid brick and the roof covered with colored slate. The woodwork of the living and dining rooms and of the hall is of chestnut, and of British Columbia fir for the remainder of the trim on the ground floor. That of the upper floor is of white pine finished old ivory. All interior walls and ceilings are plastered on metal lath and papered. There are hardwood floors throughout excepting the floors of the kitchen and laundry which are covered with linoleum. The fireplace is made of Caen cement and is encased in architectural panels of a beautiful design. All plumbing fixtures are porcelain. The total cubage of the house is 46,236 feet and that of the garage 3,456 feet. The house is heated by hot water.





Mainly Constructional

East and West—From Coast to Coast

The board of control at Toronto a few days ago ordered debentures prepared for public works totaling $5,302,000, for financing the following work: Live Stock Arena, $100,000; Pure Food Building, $100,000; Civic Garage, $42,000; New Stable, Keele Street, $60,000; Toronto Hydro-Electric System, $1,000,000; Toronto Transportation Commission, $4,000,000.

There is a rumor of a new $140,000 bridge over the Bathurst Ravine, between St. Clair and Eglinton Avenues, Toronto. The York County Council at a recent meeting received deputations from the York Township Council and the British Colonial Land Securities Ltd., asking for the county's assistance in carrying out the construction of such a structure.

The estimated loss caused by the recent disastrous fire at the plant of the Asbestos Corporation of Canada, Ltd., at Thetford Mines, P.Q., is placed at $400,000 to building and $250,000 to contents. A recent announcement states the company will rebuild the mill.

Messrs. McGuire & Cameron, who have the contract on the St. John dry dock, St. John, N.B., have now 450 men employed and report that good progress is being made on the work.

The construction program of the Canadian National Railways provides for a total expenditure of over $28,000,000, and ranges from Vancouver Island in the far West to Guysboro', Nova Scotia, in the East. Out of the total nearly eighteen million dollars will be expended in the Prairie Provinces, over three millions in British Columbia, nearly five millions in the Maritime Provinces, about two millions in Ontario, and less than half a million in Quebec.

This year's estimates for road work in Essex County, Ont., show a total of $558,000 to be expended in this connection.

W. G. Armstrong Whitworth & Company, Ltd., have just awarded to William I. Bishop, Limited of Montreal, the contract for the design and construction of a large hollow reinforced concrete dam, about 1,080 feet long and 75 feet high on Junction brook, near Grand Lake, Newfoundland. This dam is part of the power development scheme in connection with new 400-ton paper mill that is being built at Corner Brook. The purpose of the dam is to create a storage in Grand Lake by raising the water about twenty feet and increasing the area from about 130 to 180 square miles. The power house is located about eight miles from the dam; the water being carried to same by means of a canal about seven miles long, and penstocks 4,000 feet long; the resulting head being 260 feet. The work on this contract will commence immediately and is to be completed by September 1, 1924.

The Provincial Board of Health of Ontario is pressing the installation of a water supply system at the town of Port Colborne.

The huge concrete dam being erected in connection with the Sumas reclamation scheme, at Sumas Lake, B.C., is nearing completion and the pumps and gates are all in place. The pumping will hardly be commenced before the fall, as the concrete must be given time to cure.

Township engineer Goedike's report, suggesting a joint sewerage system for Scarboro and the eastern section of York township, found favor with the York township council. The estimated total cost for trunk sewers is $170,000, York to bear $95,000 and Scarboro $75,000. A disposal plant is proposed to be located at the head of Pape Avenue. Mr. R. O. Wynne-Roberts, prominent Toronto engineer, has been mentioned as probable consulting engineer to deal further with the proposal.

Work of widening and deepening the entrance to Vancouver harbor is to begin immediately, according to announcement by the public works department. The Narrows will be widened by 500 feet, as well as deepened, and for this purpose the government dredge, Mastodon, will be used. The work will require all summer to complete.

It is said that the Manitoba Stone Company are considering the location of a branch plant at either Hamilton or Toronto. The company have the contract to supply stone for the new collegiate in Hamilton. The city council at Hamilton a few days ago passed a motion to borrow $600,000 for the purpose of building this collegiate.

Plans are at present under way for the erection of a ten-storey commercial building on the southwest corner of Bleury and Concord Sts., Montreal. The owners of the property, J. A. Caron and A. L. Caron, yesterday made a formal transfer of the property to the "Bleury-Concord Incorporated" for $200,310 and other good considerations, and under this name will proceed with the enterprise. The preptry includes part of lot number 188, part of 189, in St. Lawrence ward, and measures 9,434 feet and 136 by 122 feet.

Personals

Mr. W. S. Cameron, vice-president of the A. B. Ormsby Co. Ltd., Toronto, left recently for Winnipeg for the purpose of bringing his family to Toronto, where they will take up permanent residence.

Mr. S. B. Wass, engineer who has been in charge of construction work at the new C.N.R. terminal, Fort William, left that city recently for Toronto, where he is to take charge of the construction of the Toronto Eastern Railway. He will establish an office at Oshawa, Ont., when this work commences.

Messrs. Franklin E. Belfry and Ewart G. Wilson, architects, of Toronto, have formed a partnership under the firm name of Belfry & Wilson, with offices in the Canadian Bank of Commerce Bldg., 2 Bloor St. W., Toronto.

Obituary

Mr. John Lucas, a well-known Toronto citizen, and president of the J. Lucas & Company, Limited, builders' and contractors' supplies, died recently at his residence, 377 Spadina Avenue, after a short illness. He was born at Portsmouth, England, in 1843, and lived in Toronto fifty-four years. In 1869 he started as a builder and contractor and subsequently founded the company with which he was associated until his death.

Trade Incorporations

Paquin & Sicard, Ltd., with head office at Lotbiniere, P.Q., capital $20,000, to carry on a general contracting business.

The J. H. Dodgson Tile & Mosaic Co. Ltd., with head office at 745 St. Catherine St. W., Montreal, capital $15,000, to deal in and construct tiling, mosaic and marble work, etc.

Concrete Units, Ltd., with head office at Toronto, capital, $40,000, to manufacture and deal in concrete and to carry on the business of contractors.

E. P. Muntz Engineering Co. Ltd., with head office at Toronto, capital $40,000, to carry on an engineering and contracting business.

Standard Brick Company, Ltd., with head office at Montreal, capital $90,000, to manufacture brick, terra cotta, tile, sewer pipe, etc.

CONSTRUCTIONAL ACTIVITY

Period of June 20 to June 26, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Arborg, Man.

Tenders for clearing, grading and building culverts will be received by I. Ingaldson, clerk of Arborg, until July 2.

Collingwood, Ont.

About 3,800 sq. ft. of concrete sidewalks and 1,800 lineal feet of curbs are contemplated by the town council for St. Paul St., between Huron and Simcoe Sts.

Essex, Ont.

Tenders for the construction of a drain in Colchester north township, will be received by the township clerk, A. C. Atkinson, R. R. 2, Essex, until July 6. Plans and specifications are at the clerk's office and with Gesto & Laird & Laird, Essex.

Hamilton, Ont.

Barton township council is preparing a by-law to authorize the expenditure necessary to have sidewalks laid on David and Brucedale Aves. Mr. Brant, Court House, Hamilton, clerk.

Islington, Ont.

Tenders for the following waterworks extensions will be received by S. Barrat, clerk of Etobicoke township, Islington. until July 9: (a) laying about 1,800 lineal feet of 12 in. watermains on Dundas St. (b) constructing a steel water tower 30 ft. in diameter and 100 ft. high to the top water line. (c) encasing the water tower either with brick or gunite. R. O. Wynne-Roberts & Son, 88 Church St., Toronto, engineers.

Ottawa, Ont.

The paving of Hilda St. from Wellington St. to Scott St. with asphalt, at a cost of $10,000, and St. Patrick St. to the bridge approaches with asphalt and wood blocks, at a cost of $7,000, is contemplated by the city. A. F. Macallum, Commissioner of Works.

H. R. Washington, Court House, Ottawa, clerk of Goulbourn township, is receiving tenders for one mile of bituminous macadam pavement. Patterson & Byrne, 71½ Sparks St., Ottawa, engineers.

Point Grey, B. C.

The municipality of Point Grey will receive tenders addressed to Henry Floyd, 5851 West Blvd., Vancouver, for the following waterworks supplies until July 9: 5,000 ft. 4 in. waterpipe, 10,000 ft. of 6 in. waterpipe, 1,000 ft. of 8 in. waterpipe, 1,000 ft. of 10 in. waterpipe.

Quebec, Que.

The Provincial Government, Department of Roads, will receive tenders for the construction of 2,050 ft. of gravel road in the village of Val Jalbert, on the St. Bruno-Roberval-St. Bruno highway and the construction of 5,239 ft. of gravel road in the village of Tres St. Redempteur, on the Levis-Rimouski highway, until July 10.

The Provincial Government, Department of Roads, will receive tenders until July 14 for the gravelling of the Richmond-Yamaska highway in the township of Wickham 44,855 ft. and the township of Grantham, 1,019 ft. J. L. Boulanger, Deputy-minister of roads.

St. Clet, Que.

The town council has decided to have repairs made to a macadam road. All materials will be purchased by the town clerk, Edouard Leduc, St. Clet.

Sudbury, Ont.

The town council has decided to macadamize Notre Dame Ave., Pembroke St., Wilma St., Lloyd St., and Wolf St at a cost of $15,278. W. J. Ross, town clerk.

Thornbury, Ont.

James Proctor & Redfern, 36 Toronto St., Toronto, engineers, will call for tenders for a $20,000 waterworks system for the town, early in July. Sewer pipe, hydrants, stand pipe and two filter beds will be included in the system.

Whitby, Ont.

Tenders for dredging and laying 1,000 feet of flanged steel intake pipe for the town will be received by F. W. Thorold Co. Ltd., engineers, 54 Admiral Rd., Toronto, until July 16.

CONTRACTS AWARDED

New Toronto, Ont.

Federal Construction Co., 331 Bay St., Toronto, has been awarded the general contract for an extension to the intake pipe by the New Toronto Public Utilities Commission at an approximate cost of $36,800.

The Public Utilities Commission, Stop 20, Lake Shore Rd., has awarded the Horton Steel Works Ltd., Bridgeburg a contract for steel pipe at $9,970. A contract for flexible joints has been awarded to Canadian Consolidated Rubber Co. Ltd., 1 Front St., east, Toronto.

Owen Sound, Ont.

The city council has awarded the Mitchell Contracting Co. Ltd., 43 Elmwood Ave., London, the general contract for 5,000 lineal feet of sewers ranging from 42 inch to 12 inch. The city will supply concrete and vitrified clay pipe.

Quebec, Que.

The general contract for repairs to a bituminous macadam section of the Levis-Rimouski highway has been awarded to Normand & Normand, L'Islet, at $21,965.30, by the Provincial Department of Roads.

Regina, Sask.

The Provincial Government, Department of Highways, has awarded the following contracts for roadwork: Abbey to Lancer, Gibb Bros. $10,200; Battleford south thirteen miles, C. B. Morgan, $22,000 and west from Kronau, A. Gottselig, Regina, $7,200.

Toronto, Ont.

York township council has awarded the following contracts for concrete sidewalks: Bude St.—J. Harper, 1414 Davenport Rd. at $3,700; Dentonia Park Ave. $1,600, Lasell Ave. $2,150, Lumsden Ave. $2,000, Monarch Park Ave, $2,800, Poulton Ave. $3,800, Queensdale Ave.$4,000, H. S. Walton, Gamble Ave.; Rushton Rd. $2,200, S. Simpson, 227 Wychwood Ave.; Stratton Ave. $1,700, J. McAdam, 45 Jarvis St.

The general contract for laying an asphalt pavement on Parliament St. has been awarded by the city council to the Godson Contracting Co., Manning Chambers, at $83,309.

York township council has awarded the following contracts for waterworks supplies: 6 in. and 12 in. cast iron pipe, $50,025—National Iron Corporation Ltd., Cherry St., Toronto; hydrants, $2,238—cast iron specials, $2,270—J. T. Hepburn Ltd., Van Horne St., Toronto; valve chambers covers, $3,508—Dominion Wheel Corporation, 131 Eastern Ave, Toronto; 6 in. and 12 in. stop valves, $8,660—Drummond McCall & Co., 373 Front St. east, Toronto.

The City of Toronto, will probably award the following contracts for pavements and sidewalks: Applegrove Ave. $7,097 and Munro St. $11,601, asphalt pavement, Commissioner of Works; Atlas Ave. $1,975 and Pinewood Ave. $1,052, asphalt pavement, Contracting and Paving Co., Confederation Life Bldg.; Duart Park Rd. $4,241, asphalt Pavement, Kilmer & Barber, 10 Adelaide St. east.—Patricia Drive $3,567, bitulithic pavement, Warren Bituminous Paving Co. of Ontario Ltd., 54 University Ave.; Prescott Ave. $16,780 and Roblock Ave. $1,800, bitulithic pavement, Asphaltic Concrete Co., Excelsior Life Bldg.; Rose Park Drive $6,480 and Slade Ave. $4,727, bitulithic pavement, Asphalt Concrete Co., Excelsior Life Bldg.— Tyndall Ave. $10,863 bitulithic surface, Warren Bituminous Paving Co. of Ontario Ltd., 54 University Ave.—Balliol St. $6,490, Cashlin Ave. $2,227, Millwood Rd. $5,090. Glenforest Rd. $11,081, Orchard View Blvd. $5,864, concrete pavements, Grant Contracting Co., 50 Front St. east; Castlefield Ave. $3,299, Keewatin Ave. $5,475, concrete pavements, Warren Bituminous Paving Co. of Ontario. Ltd.; two lanes, $1,855 and $6,765, concrete pavements, Ramsay Contracting Co., 39 Indian Cres.—Commissioner of Works, submitted the lowest tender for concrete sidewalks. Lowest for pavement was submitted by the

Warren Bituminous Paving Co. of Ontario Ltd., $100,935.

Victoria, B. C.

The Provincial Government, Department of Public Works, has awarded O. M. Watson, Alice Arm, the general contract for a section of the Hyder road costing about $37,000. Materials have not yet been secured by the general contractor.

Winnipeg, Man.

The city engineer's department will lay granolithic sidewalks and pavements costing $34,190.75.

Railroads, Bridges and Wharves

Montreal, Que.

Montreal Board of Harbor Commissioners have recommended to the Dominion Government the construction of a bridge across the St. Lawrence river, immediately below Victoria Bridge. It is estimated that this work would cost $3,000,000.

Quebec, Que.

It is the intention of the Provincial Government, Department of Public Works, to build an iron bridge at St. Theodore d'Acton, Bagot county. I. E. Vallee, engineer.

Welland, Ont.

Tenders are being received by Robert Cooper, clerk of Wainfleet township, Welland, for the construction of the following bridges: (a) 100 ft through Pratt truss highway bridge, including abutments and concrete floors. (b) 72 ft. low Warren truss highway bridge, including abutments and concrete floors. (c) 14 ft. concrete slab culvert. Ross & Scott, McCaw Block, Welland, engineers.

CONTRACTS AWARDED

North Bay, Ont.

The general contract for the construction of a branch line from Swastika to Larder has been awarded by the T. & N.O. Lake Railway to Sinclair Construction Co. 505 Excelsior Life Bldg., Toronto. Jeffrey & Stevens, 23 McIntyde St. E., North Bay, have general contract for a $20,000 extension to the offices of the T. & N. O. Railway.

Oshawa, Ont.

Standard Paving Co., Central Chambers, Ottawa will lay 3,300 feet of street railway tracks for the Oshawa Street Railway at a cost of $23,000.

Walkerton, Ont.

Bruce county council has awarded William Mackenzie, Wiarton, the general contract for twenty steel and concrete culverts to be built in Arran and Amabel townships. The council will supply steel and cement. These materials have not yet been purchased. G. E. Stevenson, Walkerton, engineer

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Public Buildings, Churches and Schools

Asbestos, Que.

W. Roberge, Asbestos, will build a three storey building, containing a store and apartment, solid brick construction, costing $15,000.

Bradford, Ont.

Bulk and separate tenders for the construction of a two storey steel and concrete high school will be received by D. R. Franklin, architect, 587½ Yonge St., Toronto.

Ford, Ont.

Tenders for the general contract for a heat treating building for Ford Motor Co. of Canada Ltd., Ford, will be received by Albert Khan Ltd., architect, until July 3. Separate tenders for structural steel will be received by the architect until July 5.

Huntsville, Ont.

Bulk and separate tenders for the erection of an addition to the Public School will be received by Hart Proudfoot, secretary-treasurer of the School Board until July 7. Tenders may be for labor only or for material and labor.

Kitchener, Ont.

Watt & Blackwell, Bank of Toronto Bldg., London, architects, will receive tenders until July 3 for the construction of a three storey hospital for the Sisters of St. Joseph. The building, which will be built of oramental brick, will have two wings 42 ft. x 102 ft., and the main building will be 48 ft. x 180 ft.

London, Ont.

A new parish hall is contemplated by the congregation of St. George's Anglican Church. Plans will be prepared and estimated secured.

Mount Dennis, Ont.

Frank A. Gay, 45 Roehampton Ave., architect, has prepared plans for a two storey stone and brick church, for the Methodist congregation. The building will be erected on Eglinton Ave., near Weston Road.

Montreal, Que.

Contracts for roofing, wiring, plumbing, plastering, brickwork and tiling, for four stores and apartments costing $22,000 will be let by S. Marotta, 19 St. Catherine St. east, general contractor.

St. Mary's College, 232 Bleury St., contemplates a building on Decelles St. between Ste. Catherine Road and Maplewood Ave. Work may proceed this fall.

Ottawa, Ont.

Tenders for alterations to a store, estimated to cost $60,000, are being received by J. A. Ewart, Jackson Bldg., architect, until June 30. Plans and specifications are at the offices of the architect.

Quebec, Que.

Stevens & Lee, 62 Charles St. east, Toronto, have prepared sketch plans for a hospital for the Sisters of Quebec Hospital, 11 Palace Hill, Quebec. The building will consist of three large wings, steel, stone and brick construction and is estimated to cost $600,000.

Tenders will be called shortly by Bergeron & Lemay, architects, for the construction of a Forest school for the Seminary of Quebec, Ste. Foy Road. The building will be stone and brick, fireproof construction, four storeys high, 54 ft. x 180 ft.

Rowden, Que.

The Roman Catholic Parish contemplates the erection of a church costing $50,000 The work may proceed this autumn.

Three Rivers, Que.

The Geo Christie Co. Ltd., Glasgow, Scotland, contemplate building an addition to their factory at this place. The addition will be three storeys high, 120 ft. x 40 ft., concrete, steel and brick construction.

Toronto, Ont.

Tenders for plastering, plumbing and heating for the Church of the Advent, Crawford St. near Harbord, are being received by C. F. Taylor, c/o T. H. Capes, 66 Hayden St., architect.

Tenders for plumbing and heating for the Hebrew Institute, Brunswick Ave., will be received by B. Brown, architect, 287 Spadina ave.

Plans are being prepared by Arnoldi & McMaster, Confederation Life Bldg., for a brick church, 42 ft. x 105 ft., for St. Dunstan's Anglican congregation, Lansdowne and Wallace Aves.

Tenders will be called the first week in July by D. R. Franklin, architect, 587½ Yonge St., for a lodge building containing offices and stores, for the Toronto Junction District Orange Building Co. Ltd. N. J. Rogers, 46 Boon Ave., president.

R. H. Harman & Son, 248 Dupont St. will let contracts for steel, roofing, heating, plumbing, plastering and electrical work for two stores with apartments above costing $20,000.

Truro, N. S.

E. D. Vernon, architect, Truro, is receiving tenders for the erecton of a brick building 56 ft. x 90 ft., with slate roof, for Maritime Home for Girls, until July 11. The cost of this structure is estimated at $40,000.

Valois, Que.

A. T. Hawke, general contractor, St. Anne de Bellevue, will let contracts for roofing, wiring, plumbing, heating, plastering, painting and glazing for a $35,000 school.

Windsor, Ont.

Windsor Public School Board intends to build an addition to Victoria Ave. school. The architects have not yet been appointed.

The Public School Board also intends to build an eight room addition to a school on Assumption St. G. A. Courtenay, 1467 Dougall Ave., secretary of the board.
The architect has not yet been appointed

CONTRACTS AWARDED

Fredericton, N. B.

Rhodes, Curry & Co. Ltd., Amherst, N. S., have the general contract for a station for the Canadian Pacific Railway Co. at approximately $45,000. The structure will be of brick with a concrete foundation

Kincaid, Sask.

Wilson & Wilson Ltd., 1363 Albert St., Rebina, will build a brick schoolhouse, 40 ft. x 60 ft., for Kincaid School Board at a cost of $20,000. Necessary materials have not yet been purchased.

London, Ont.

John Hayman & Sons Co. Ltd., 432 Wellington St., have been awarded the general contract for an addition to the Technical School at an approximate cost of $90,000. L. E. Carrothers, architect, prepared the plans for the Board of [illegible]

North Vancouver, B. C.

Atkinson & Dill, 707 Welton Bldg., Vancouver, have been awarded the general contract for a two storey high school, 114 ft. x 180 ft., frame and stucco construction The building will cost about $80,000. Benzie & Bow, architects, 618 Standard Bank Bldg., Vancouver.

Ottawa, Ont.

Otis Fensom Elevator Co., 170 Bay St., Toronto, have been awarded the contract for elevators for the service building for the new hospital at $61,205.

Peterborough, Ont.

T. Ephgrave, 25 McDonnell St., has been awarded the general contract for alterations to St. Andrew's Sunday school costing $30,000. The plumbing contract has been awarded to Wallace & Smith, 222 London St. and the heating contract to R. G. Sturgeon & Co., 202 Charlotte St.

St. Vital, Man.

Sutherland Construction Co. Ltd., Merchants Bank Bldg., Winnipeg, general contractors, will erect a $60,000 addition to Norberry school. Plumbing and heating contracts were let to Cotter Bros., Fort & Mary St., Winnipeg.

Toronto, Ont.

A contract for steel sash for Jarvis St. Collegiate, was awarded to the Architectural Bronze Co., Toronto, by the Board of Education, at $14,000.

The contract for plasterng Leslie Gardens School has been awarded to W. J. Hynes, 858 Dupont St., by the Board of Education.

The Board of Education has awarded the following contracts for the addition to Riverdale Collegiate: Masonry, $38,000, T. Harman, 38 Seaton St.; steel, $4,064, McGregor & McIntyre, Ltd., Shaw St.; plumbing and heating, $13,277, W. G. Edge Ltd., 45 Richmond St.; carpentry, $20,958, Fred Markham, 15 Alexander Blvd.; wiring, $6,300, Canada Electric Co., 175 King St. east; oil burners, Pneu Oil Burner Co., 292 sherbourne St.

J. S. Laxton, 4 Patterson Ave., Toronto, has been awarded the general contract for an addition to a school at Long Branch, by S. S. 12 Etobicoke township. The addition will consist of four rooms, two storeys and basement, brick construction. J. H. Doughty, Mimico, has the plumbing and heating contracts.

Valois, Que.

The general contract for a school for the Protestant School Commission of Pointe Claire and Beaconsfield, has been awarded to A. T. Hawke, St. Anne de Bellevue. Materials will be purchased by the general contractor.

William's Lake, B. C.

The general contract for an $11,000 hospital has been awarded by William's Lake Hospital Board to Joyce & Hilborn, Quensel, B. C.

Business Buildings and Industrial Plants

Cornwall, Ont.

The following general contractors have submitted tenders for the construction of an addition to the Howard Smith Paper Mills, Cornwall; E. G. M. Cape & Co., 10 Cathcart St., Montreal; Anglin-Norcross Ltd., 65 Victoria St., Montreal; Church & Ross Co. Ltd., 10 Cathcart St., Montreal; Bremner Norris & Co. Ltd., McGill College Ave., Montreal; A. F. Byers & Co. Ltd., 340 University Ave., Montreal; W. M. Irving, 26a Stanley St., Montreal; Atlas Construction Co., 37 Belmont St., Montreal; Atkinson & Co., Cornwall.

Hamilton, Ont.

Among the general contractors submitting tenders for the construction of the addition to the Canadian Westinghouse plant estimated to cost $1,200,000 are: Anglin-Norcross Co., Temple Bldg., Toronto; W. M. Sutherland and Co. Ltd. 43 Adelaide St. West, Toronto; Carswell Construction Co. Ltd., 58 Wellington St. East, Toronto; Canadian Engineering & Contracting Co. Ltd., 72 James St. north, Hamilton; P. H. Secord & Sons, Construction Co. Ltd., Spectator Bldg., Hamilton; Pigott-Healy Construction Co., 36 James St. South, Hamilton; Frid Construction Co. Ltd., Clyde Block, Hamilton; W. H. Cooper, Clyde Block, Hamilton; W. H. Yates Construction Co. Ltd., 17 Main St. East, Hamilton.

Leamington, Ont.

Tenders for all trades necessary for the construction of a $14,000 store block are invited by A. J. Wahby, Box 1071, Leamington.

Montreal, Que.

Thompson Starrett Co. Ltd., 511 St. Catherine St., will let masonry, carpentry, roofing, electrical, plumbing, heating, plastering, painting, tiling, millwork, ornamental iron and glazing contracts for an office building costing $1,250,000.

Bannell Bros., 341 Guy St., general contractors will let contracts for roofing, masonry, electric wiring, plumbing, heating, plastering, painting and millwork for a molasses distillery for Commercial Alcohol Co., costing $25,000.

Brandram-Henderson Ltd., Montreal, contemplate the erection of a factory costing $200,000. A bond issue to finance construction has been sold but the company is undecided when work will proceed.

Chas. Mitchell, 304 University Ave., is preparing plans for an hotel to be built at Three Rivers. The architect will call for tenders when plans are completed.

Sackville, N. B.

Tenders will be called immediately for the construction of a three storey pressed brick building for Myrtle Logde, I.O.O.F. J. Dobson, Sackville, business agent.

Toronto, Ont.

Bulk and separate tenders for all except mechanical trades for the construction of a two storey factory building, 90 ft. x 120 ft., will be called shortly by D. C. Cotton, 54 Adelaide St., architect. The building will be erected at Windsor Mills, Que., for Kilgour Bros., 21 Wellington St. West.

Windsor, Ont.

The erection of a three storey business block on Pitt St. is contemplated by the Canadian Westinghouse Co., Hamilton. Plans and specifications are with the company's building department.

CONTRACTS AWARDED

Blairmore, Alta.

E. L. Pozzi, Blairmore, will build a $13,000 garage, 50 ft. x 115 ft., brick and concrete construction for L. Dutil.

Iroquois, Ont.

Robert Beggs, Hallville, will build a one storey linen mill, 144 ft. x 37 ft., concrete, brick and steel construction, for H. H. Caldwell.

Montreal, Que.

Commercial Alcohol Co., c/o John Irwin, 20 St. Paul St., president, has awarded Bannell Bros., 341 Guy St., the general contract for a molasses distillery costing $25,000.

Quebec, Que.

J. O. Gilbert, 99½ Lockwell St., has awarded the following contracts for the construction of the St. Roch hotel: Masonry, J. B. Jinchereau & Fils, 325 Richardson St.; steel, Eastern Canada Steel & Iron Works Co., Lesage Ave.; carpentry, L. N. Lamonde, 52 St. Francois St.

Contracts awarded for re-building la Banque Nationale, St. Joseph St. branch, costing $60,000 are as follows: Masonry, plastering and joinery, M. Cauchon, Richardson St.; roofing, E. Falardeau, Dorchester St.; painting and glazing, La Gie Gauthier & Frere, St. Joseph St.; plumbing, heating and electrical work, O. Picard & Fils, St. John St.; marble, slate, tile and terrazzo, Jobin & Genois, Cote d'Abraham. Pierre Levesque, architect, 115 St. John St.

Toronto, Ont.

F. E. Taylor, 1842 Gerrard St., has the general contract for a store and eight apartments costing $60,000. All material will be purchased by the general contractor who will also let the sub-trades. Thomson & Chown, architects, 59 Yonge St.

Plumbing and heating contracts for the addition to the factory of the Canada Bread Co., Pears Ave., have been awarded to Bennett & Wright, 72 Queen St. East.

R. H. King, 277 Indian Road, has the general contract for a $20,000 addition to a garage for Parkdale Motors, 1453 Queen St. West. The building will consist of offices and show rooms, 73 ft. x 120 ft.

W. A. Moffat Co., 86 Don Esplanade, have the roofing contract for a factory for Bradshaw's Ltd., Symington Ave. Plumbing and heating contracts have been awarded to Purdy Mansell Ltd., 63 Albert St.

Windsor, Ont.

Plumbing and heating contracts for an addition to the Universal Garage, Chatham St., have been let to C. E. Greenan Co., 342 Ellis Ave., Windsor.

Residences

Chatham, Ont.

Frank Brown, 85 Raleigh St., will let all sub-trades for a residence costing $12,000.

Hamilton, Ont.

John Vogan, 280 Sanford St. North, will build a brick apartment house costing $12,000.

J. A. Jones. 1144 King St. east, has commences work on an $8,000 residence, two storeys high, brick and concrete construction.

Sub-trades for a residence costing $10,000 may be let by R. Whelpton, Tragina Ave., general contractor.

Limoilou, Que.

O. Brocher, 63 4th St., will build a three storey five family residence, brick veneer construction, costing $15,000.

Montreal, Que.

P. Blais, 489 Girouard St., is building two residences costing 12,000 and will let roofing, electrical, plumbing, heating and plastering contracts.

F. G. Robb, architect, 127 Stanley St., is preparing plans for an apartment house costing $1,000,000. The building will be ten storeys high and will contain fifty suites. J. D'Arcy, 342 Peel St., is the business agent.

Reid Bros., general contractors, 3A Tower St., will let all sub-trades for a residence costing $28,000.

Sault Ste. Marie, Ont.

Findlay & Foulis, 527 Queen St., Sault Ste. Marie, are receiving tenders for the construction of a nurses' home. The building will be three storeys high, 30 ft. x 58 ft., brick construction.

Toronto, Ont.

S. Coulston, 546 Beresford Ave., has not yet let plastering, heating, plumbing, electrical and painting contracts for a residence costing $8,000.

Masonry, plumbing, heating, wiring and plastering contracts for a $10,000 residence will be let by John Schultz, 325 High Park Ave.

Plans for a $30,000 residence, one storey, 70 ft. x 44 ft., stone, tile and stucco construction, are being prepared by H. R. Watson, 36 Toronto St.

Belfry & Wilson, architects, 2 Bloor St. West, will call for tenders shortly for the construction of a two storey brick residence costing $20,000. The building will be erected near Oakville.

Plans for a $20,000 residence have been prepared by J. H. Stanford & Son, Yonge St. Arcade, for R. Mowbray, c/o architects. This structure will be of stucco and brick construction with tile foundation.

The building of an apartment house on either Carlton or Gerrard Streets, near Church St., is contemplated by C. Dunn, 335 Gerrard St. East. P. L. Davis, architect, 309 Gerrard St. East, is preparing plans.

Tenders for all trades necessary for the erection of a residence costing $20,000 will be let by W. C. Kettlewell, 72 Heath St. Materials for this structure have not yet been purchased.

Martin Baldwin, 43 Bloor St. East, has prepared plans for three residences, estimated to cost $10,000 each, for S. H. Lumb, 31 Oakdene Cres. Materials will be purchased by the owner who will also let sub-trades.

Vancouver, B. C.

A. W. Lightheart, Seymour & Helmcken Sts., will build a $20,000 addition to an apartment block., This addition will be 50 ft. x 120 ft., stone and brick construction.

CONTRACTS AWARDED

Hamilton, Ont.

C. H. Roper, 81 Carrick Ave., general contractor, will build an aparment house costing $18,000. The building will be two storeys high, concrete block foundation, brick construction.

London, Ont.

Geo. Stark, c/o Col. F. B. Ware, 476 Colborne St., has the general contract for a two storey brick residence, 36 ft. x 27 ft. costing $10,000.

Montreal, Que.

Atwater Construction Co., Atwater & St. Luc Sts., have awarded the following contracts for the construction of a $90,000 apartment house: Steel, Dominion Bridge Co. Ltd., Lachine; roofing, Dominion Sheet Metal Works, 346a Clarke St.; plumbing and heating, Conroy Bros., 866 St. Catherine St. West; ornamental iron and fire escapes, Silverman Iron Worns, 587b Colonial St.; marble and tile, Brown & Sons, 25 Victoria St.

Reid Bros., 3A Tower St., have awarded the contract for stone for a $25,000 residence to Morrison Quarry Co., 128 Bleury St. Dominion Bridge Co. Ltd., Lachine, has the contract for steel. Roofing will be supplied by the Metal Shingle & Siding Co. Ltd., 91 Delorimer Ave. and Reed & Cambridge will install plumbing and heating.

Quebec, Que.

The general contract for a two storey residence. concrete and brick veneer construction, has been awarded to J. A. Laberge, L'Ange Gardien, Quebec, by Bergeron & Lemay, 145 St. John's St.

Toronto, Ont.

E. J. Curry, 146 King St. west, has been awarded the general contract for plastering an apartment house on Spadina Ave. near Coulson Ave. The building is estimated to cost $95,000.

D. C. Kay, 258 Ashdale Ave., will build a $20,000 brick and stucco residence at Donlands for J. R. Staunton, c/o H. R. Watson, 36 Toronto St., Toronto, architect.

Graham & Sibbett, 9 Wellington St. East, general contractors, will build a residence on Walmer Road Hill costing $18,000. The dwelling will be constructed of hollow tile and stucco.

Vancouver, B. C.

Harrison & Lamond, 501 Pacific Ave., are general contractors for an $8,000 residence for B. F. Cope, 1375—13th Ave. West, Vancouver.

J L. Skeent, 1224 Oxford St., has been awarded the general contract for an apartment block. concrete and brick construction, and will commence work at once. Percy Fox, Brown Block, Victoria, architect.

Walkerville, Ont.

Bruce Bros., Davis Bldg., have been awarded the general contract for a $25,000 brick veneer residence. Materials for this structure have not yet been purchased. Pennington & Boyll, Bartlet Bldg., architects.

Power Plants Electricity and Telephones

Toronto, Ont.

The Hydro-Electric Commission of Ontario is having plans prepared for an addition to the Davenport transformer station. F. A. Gaby, 190 University Ave., Toronto, engineer.

CONTRACTS AWARDED

Montreal, Que.

W. M. Irving, general contractor, 26 Stanley St., who is building a $45,000 power house for the Montreal Light, Heat and Power Co., Craig St., has awarded the following contracts: Masonry, Canadian Hydro Stone Ltd., Montreal East; architectural iron, Northern Architectural Iron Works, 130 Van Horne Ave.; roofing and steel sash, Metal Shingle and Siding Co., 91 Delorimer Ave.

Saskatoon, Sask.

University of Saskatchewan, Saskatoon, awarded Smith Bros. and Wilson Lad., 1420-8th Axe., Regina, the general contract for an addition to the power house in connection with the University, at $58,300.

Miscellaneous

Ottawa, Ont.

Tenders for the construction of a wharf and protection pile work at Matane, Quebec, will be received by the Department of Public Works, until July 6. R. C. Desrochers, secretary, Department of Public Works.

Quebec, Que.

A Provincial charter has been granted to the Canada Lime Stone Co. Ltd., capital $20,000, head office, Quebec, to deal in limestone, sandstone, granite and marble or other kinds of stone and their natural by-products.

Toronto, Ont.

Tenders for repairs to the breakwater at Toronto Island will be received by R. C. Desrochers, secretary, Department of Public Works, Ottawa, until July 12. Plans and specifications are at the department and at the offices of the district engineer, Equity Bldg., Toronto.

CONTRACTS AWARDED

Edmonton, Alta.

O'Neil, Morkin Co., Edmonton have been awarded a contract by the city for cast iron pipe costing $22,016.

Weston, Ont.

The following contracts for the installation of a central heating plant at the Toronto Free Hospital for Consumptives have been awarded by the building committee; Piping and heating, Purdy Mansell Ltd., 63 Albert St., Toronto; boilers, furnaces and chimney, John Inglis Co. Ltd., 14 Strachan Ave., Toronto.

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders Wanted

Sealed tenders marked "Tenders for River Crossing" will be received by the undersigned [illegible] until noon on

Tuesday, July 3rd, 1923,

for the construction of a twenty inch water main across the Grand River at Galt.

Plans and specifications may be seen at the office of the undersigned.

The lowest or any tender not necessarily accepted.

W. H. FAIRCHILD,
25-26 Manager, Public Utilities, Galt.

NEW INTAKE

WHITBY WATERWORKS

[illegible] invited to submit tenders for dredging trench and laying 1,000 feet of Flanged Steel Intake Pipe in Lake Ontario at Whitby. The depth of water varies from ten to twenty-two feet.

Tenders must be in Whitby before 8.00 P.M., Eastern Standard Time, on

Monday, July 16th, 1923,

Full particulars may be obtained from the engineers.

W. J. LUKE ESQ.,
Chairman Public Utility Commission,
Whitby, Ont.

F. W. THOROLD CO. LIMITED,
Consulting Engineers,
25-26 54 Admiral Road, Toronto.

Tenders for Bridges

Sealed tenders will be received by the undersigned up to

Saturday, June 30th, 1923,

for the undermentioned works:

(a) A 100 ft. through Pratt truss Highway Bridge, including abutments and concrete floor.

(b) A 72 ft. low Warren truss Highway Bridge, including concrete abutments and concrete floor.

(c) A 14 ft. concrete slab culvert.

All are situated in the vicinity of Port Davidson Station, in Wainfleet Township, in the County of Welland and Province of Ontario.

Tenders must be accompanied by a certified cheque or other satisfactory deposit payable to the Treasurer of the County of Welland for the amount of One Thousand Dollars, ($1,000.00). Deposits of unsuccessful tenderers will be returned when contracts are awarded.

The municipality reserves the right to reject any or all tenders or to waive any defects or irregularities therein.

Plans and Specifications will be furnished by the Engineers, Ross and Scott, Welland, Ont., upon receipt of a deposit of Ten Dollars ($10.00), which sum will be refunded upon return of the said plans and specifications, accompanied by a bona fide tender.

ROBERT COOPER,
County Clerk.
Welland, June 13th, 1923. 25-26

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Tenders for Pavement

Sealed tenders marked "Tenders for Concrete Pavement" and addressed to the undersigned, will be received until 1 P.M. on

Friday, June 29th, 1923,

for about 1 mile of re-inforced concrete pavement 18′ wide, Pilette Road, in the Town of Ford City.

Plans and specifications, etc., can be seen at the office of the undersigned or at the office of J. J. Newman, Windsor, Ont., the Engineer in charge.

A marked cheque for $1,000.00 must accompany all tenders.

Work to be let subject to the approval of the Dept. of Highways.

The work to be commenced upon the completion of the installation of sewers, water mains, etc., by the Town of Ford City.

The lowest or any tender not necessarily accepted.

W. P. COYLE,
25-26 Clerk, Essex County, Sandwich, Ont.

Sealed Tenders addressed to the undersigned, and endorsed "Tender for repairs to breakwater at Toronto Island, Ont.", will be received at this office until **12 o'clock noon, (daylight** saving)

Thursday, July 12th, 1923,

for repairs to the breakwater adjacent to the southern shore of Toronto Island, County of York, Ont.

Plans and forms of contract can be seen and specification and forms of tender obtained at this Department and at the office of the District Engineer, Equity Building, Toronto, Ont.

Tenders will not be considered unless made on printed forms supplied by the Department and in accordance with the conditions contained therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p.c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

Note.—Blue prints can be obtained at this Department by depositing an accepted bank cheque for the sum of $20.00, payable to the order of the Minister of Public Works, which will be returned if the intending bidder submit a regular bid.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, June 19, 1923. 26-27

Tenders
Two Girder Bridges

Sealed Tenders addressed to R. H. Fortune, Tp. Clerk Ayton, will be received by the Council Tp. of Normanby up to 6 P.M. of

Monday, July 2nd, 1923,

for following:—

(a) Two Steel Girder Bridges, Span clear 32 ft., width of roadway clear 16 ft. Class "A", lattice railing, concrete floor.

(b) Abutments and floors for two bridges. Site of work Lot 30, Con. XIV, Township of Normanby.

A certified Bank Cheque for 5% of Tender payable to Tp. Treasurer shall accompany each tender.

Plans and Specifications may be seen at the offices of the Clerk or Engineer.

The lowest or any tender not necessarily accepted.

R. H. FORTUNE, Tp. Clerk, Ayton.
R. McDOWALL, C.E., Tp. Engineer, Owen Sound.
25-26

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 18, Section F, subsection (b)" will be received by the undersigned until eleven a.m. standard time on

Wednesday, July 11th, 1923,

for the excavation of approximately 27,000 cubic yards of earth and other work required in the construction of Provincial highway from Estevan west for 4½ miles.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:—

Wm. Grant, 105 Ross Block, Saskatoon, Sask.;
J. R. Reid, Court House, Swift Current, Sask.;
F. G. Kissack., North Battleford, Sask.;
A. G. Garrish, Sec-Treas. R.M. No. 5, Estevan, Sask.

An accepted cheque for the sum of $700.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of three p.m. standard time, on Wednesday, July 11th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER.
Deputy Minister of Highways.
Department of Highways,
Regina, Sask.
June 20th, 1923. 26

TO CONTRACTORS

Sealed tenders marked for all trades will be received up to

Saturday, July 14th, 1923,

for the construction of a new High School Building at Mitchell, Ontario.

Plans and specifications may be seen at the office of Mr. A. D. Cameron, Secretary of the High School Board, Mitchell, Ontario, or at the office of the architect, London, Ontario.

The lowest or any tender may not necessarily be accepted.

H. C. McBRIDE, Architect,
London, Ontario.
26

TOWN OF THORNBURY

Laying Water Mains

Sealed tenders marked and addressed to Mr. E. Rorke, Clerk, Thornbury, Ontario, will be received until noon, **July 9th**, for laying approximately two miles of Six Inch and Eight Inch Water Mains in the Town of Thornbury.

Plans and specifications may be seen at the office of the town clerk or the engineers.

E. RORKE, Clerk.
E. RAYMOND, Mayor.

James, Proctor & Redfern, Ltd.,
Consulting Engineers,
36 Toronto Street,
TORONTO.
26

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 26, Section C, subsection (a)" will be received by the undersigned until eleven a.m. standard time on

Wednesday, July 11th, 1923,

for the excavation of approximately 55,500 cubic yards of earth and other work required in the construction of Provincial highway from Edam to Mervin, 15 miles.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:

Wm. Grant, 105 Ross Block, Saskatoon, Sask.;
J. R. Reid, Court House, Swift Current, Sask.;
F. G. Kissack., North Battleford, Sask.;
W. K. MacDonell, Sec-Treas. R.M. No. 469, Edam, Sask.

An accepted cheque for the sum of $1,000.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of three p.m. standard time, on Wednesday, July 11th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways,
Regina, Sask.
June 20th, 1923.
26

Tenders Wanted

Sealed tenders for all trades will be received up to

Tuesday, July 3rd, 1923,

for the construction of Sunday School Building, at High Park Methodist Church, Toronto.

The lowest or any tender will not necessarily be accepted.

Plans and specifications may be seen at the office of the architect.

BELFRY & WILSON, Architects,
No 2 Bloor St. West,
TORONTO.
26

TENDERS

Sealed bulk and separate tenders addressed to Frank Kilkenny, Secretary, Board of Education, Bradford, Ont., endorsed with the word "Tender," will be received until

July 9th, 1923,

for all trades in the erection of a High School building at Bradford, Ont.

Tenders must be in the hands of the Secretary not later than 4 o'clock p.m. on the day named, after which no tender will be received.

The lowest or any tender will not necessarily be accepted.

Plans and specifications may be seen and all information obtained at the office of the architect, D. R. Franklin, 587½ Yonge street, Toronto.

C. C. WILSON,
Chairman.
26

TOWNSHIP OF ETOBICOKE

Tender for Reinforced Concrete Bridge

Sealed tenders properly marked and addressed to Mr. S. Barratt, Islington, Ontario, will be received up to 12 o'clock noon

Saturday, July 7th, 1923,

for the construction of a reinforced concrete bridge between Lots 21 and 22, Concession III.

Plans and specifications may be seen at the office of the Township Engineer, or at the office of the consulting engineers:

N. McNICOL,
Township Engineer,
Islington, Ont.

STEPHEN BARRATT,
Clerk, Islington.

W. GARDHOUSE,
Reeve.

JAMES, PROCTOR &
REDFERN, LTD.,
Consulting Engineers,
36 Toronto Street,
Toronto.
26

Township of West Garafraxa

Tenders for Bridges

Sealed tenders will be received by J. Campbell, Township Clerk, Belwood, Ont., up till 4 p.m.

July 4th, 1923,

for the following Concrete Bridges and Retaining Walls:

30 ft. Girder Bridge, known as Swift's Bridge.
20 ft. Arch Truss Bridge at Lot 4, Con. 5, known as Bain Bridge
9 ft. Culvert, in Belwood Village.
9 ft. Culvert, in Belwood Village, for private entrance.
Retaining wall 200 feet long, at Campbell Bridge.

Plans and specifications may be seen at the offices of the Clerk or Engineers on or after June 29th.

A. W. CONNOR & CO., Engineers,
34 Victoria St.,
TORONTO.
26

CAST IRON PIPE FOR SALE

30", 24" and 10". Cheap.

L. S. Tarshis & Sons,
Toronto.
26-28

For Sale or Rent

Bucyrus [illegible] yard Steam Shovel located in Toronto in A1 condition. Apply Box 236, Contract Record, Toronto. 26

For Sale—Cheap

1—6 ft. Wettlaufer Mixer on trucks with side loader and gasoline engine. Overhauled and painted and in good running condition. K. W. Lewis, 105 Front St. East, Toronto, Ont. 26

For Sale

Model 60C, Marion Shovel, 2½ yard dipper, Boiler 140 lbs. Pressure, located at Port Arthur, has worked only four months in gravel. $7,000 cash as it is and where it is. Apply Box 592, Contract Record, Toronto. 26-27

Steam Shovel for Sale

70C Bucyrus, in perfect condition, only slight minor repairs needed. Can be inspected at Woodman's Point Station near St. John, N.B. Price low. Apply A. M. McDonald, Kennedy & McDonald, Antigonish, N.S. 25-27

For Sale

5,000 lin. feet of 2" pipe, 5,000 lin. feet of 1½" pipe in good condition, used only two months.
1 Sawyer Massey Road Grader.
1—50 ton bin and screen, with elevator and buckets.
1,000—lin. feet Blaw-Knox 6" road forms.
1—C. H. & E. Water Pump.
1—London Paver.
1—Buffalo-Pit Road Roller.

Box 291, Contract Record, Toronto. 25-29

FOR SALE

All Steel Revolving Guy Derrick

Capacity—10 Tons.
Mast 90 ft. High. Boom 80 ft. Long.
Both in Sections about 30 ft
Complete with Bull Wheel, Sheaves, Pins, etc.
No Cable or Guy Ropes.

PRICE: $850.00 f.o.b. cars, New Glasgow, N.S.

This Derrick was built for our own Erection Department and is First Class in Every Particular.

THE MARITIME BRIDGE CO LTD.,
New Glasgow, N.S.
26

CONTRACTORS—Superintendent or General Foreman requires position. Life long experience. Thorough practical knowledge of Unit costs and supervision. Excellent references. Will go anywhere. Box 282, Contract Record, Toronto. 23-26

Late News

Amherst, N. S.

Rhodes Curry Ltd., Amherst, will build a $10,000 residence at Sussex, N. B., for Mrs. L. G. White, Sussex.

Chatham, Ont.

Carter & Miller, Power House Bldg., will re-surface 11,000 sq. yds. of asphalt pavement for the city at a cost of $23,000. This work will be done on Park St. from Queen St. to the railway tracks.

Cochrane, Ont.

Van Rassel Bros., Cochrane, have the general contract for a consolidated school for the Provincial Government, to be built at Charlton, at a cost of $40,000.

Corbyville, Ont.

Fire gutted the plant of Canadian Industrial Alcohol Company, Corbyville, damaging plant, equipment and products to the extent of $2,000,000.

Montreal, Que.

The city council will receive tenders until July 12 for the construction of watermains from Atwater Pumping Station to the Lachine Canal. Rene Bauset, clerk.

Plumbing, heating and electrical contracts for a church costing $200,000 will be let by Ross & McDonald, architects, 1 Belmont St. W. S. D. Cook, general contractor, will let plastering, painting and glazing contracts.

Ottawa, Ont.

Graves Construction Co., Jackson Bldg., have the general contract for an office building, brick, steel and concrete construction, costing $40,000. Burritt & Kingston, Hope Chambers, architects.

We Issue Surety Bonds

for Contractors, for Public Highways, Contracts and all Municipal and private Corporation work.

We keep up to date information on contracts let and tenders called.

Try our service.
Phone Main 3476

Special Toronto Representatives

Fidelity Insurance Co.
of Canada

FIDELITY AGENCY
OF CANADA
[illegible]

St. Catharines, Ont.

The construction of a paper mill costing $400,000 is contemplated by the Garden City Paper Co., Merriton. L. H. Gardiner, president.

Sydney, N. S.

J. W. Stevens, Townsend St., has the general contract for a nurses' home for the Hospital Commission. The building will be three storeys high, brick construction, costing $45,000.

Toronto, Ont.

Belfry & Wilson, 2 Bloor St. east, have extended the time for receiving tenders for High Park Methodist Sunday School until July 3. The building is estimated to cost $100,000.

Tenders for re-surfacing roadways and the erection of a stone wall in High Park, the erection of iron fencing in Vermont Park and the erection of iron fencing in Grange Park, will be received by the city council until July 3.

J. E. Carlisle, 181 Dunvegan Rd., will let heating, plumbing and electrical contracts for a residence costing $18,000.

China Wants Good Roads

There are only 10,000 motor cars in China as compared with 12,000,000 in the United States; but, even so, good roads are now recognized by the Chinese as a necessity.

New Zealand to Develop Hydro

Proposed hydro-electric developments in New Zealand are to involve a total expenditure of more than $60,000,000. The undertakings are to be spread over a period of ten years, and are to reach a maximum of $10,000,000 in 1925.

An Arizona Tunnel

At Globe, Ariz., in a lime quarry of the Old Dominion Company, a tunnel was driven 60 feet into the vertical face at a point 112 feet below the surface. A charge of 19 tons of dynamite was placed in the cavity; and it is estimated that from 70,000 to 100,000 tons of rock was dislodged and suitably broken up by the blast.

An Ancient Chinese Bridge

The Chinese have been acquainted with suspension bridges from time immemorial. Their most ancient historians write of bridges hung on iron chains or on rattan. Such structures seemed strange to the missionaries who reached China. They called them "flying bridges," and one recounts his horror as he felt the bridge swish beneath his steps as he crossed a deep chasm.

In Europe people ridiculed these travelers' tales and treated the accounts of the missionaries as mere stories. Later on, when they received verification, the attitude of distrust perished, and the old bridges dangling on their rusty chains, were held in derision. Then came forgetfulness, and when in 1823, the suspension bridge was introduced n Europe, not on rusty chains, but on new steel cables, people applauded the engineer's amazing ingenuity.

Limestone Statistics

Almost 90 per cent., or 1,005,210 cubic feet of the limestone quarried in the United States for building purposes in 1922 came from the State of Illinois.

MacLean Reports Cover Canada

MacLean Building Reports will give you accurate, advance information on every building and engineering contract of consequence in the Dominion.

These reports are issued daily and reach subscribers in ample time to bid on the work or submit prices for the machinery, equipment, materials or supplies required.

Subscriptions may be placed for any one city, portion of a Province or more than one Province. Rates range from $25 yearly for the smallest cities to $664.00 yearly for the entire Dominion.

Hundreds of firms are deriving much financial benefit from the use of MacLean Building Reports. Tell us what territory you cover and put it up to us to show how we can help you get more business.

Try this service out. The result will please you. Write today for rates and free sample reports.

MacLEAN BUILDING REPORTS Ltd
345 Adelaide St. W. - - TORONTO
119 Board of Trade Building - MONTREAL
325 Main St. - - - WINNIPEG
106 Winch Bldg. - - VANCOUVER

WE WILL BOND YOU

You will find us courteous, anxious to please and ready to give the best service.

Resources over - - - $31.790.000
Canadian Securities - $ 2.247.500

HEAD OFFICE
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Arthur. E. Kirkpatrick
General Manager
for Canada

BRANCH OFFICES -
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Sidney. W. Band
Assistant General
Manager

112 St James St.
MONTREAL

W. R. Kirkpatrick
Canadian Secretary

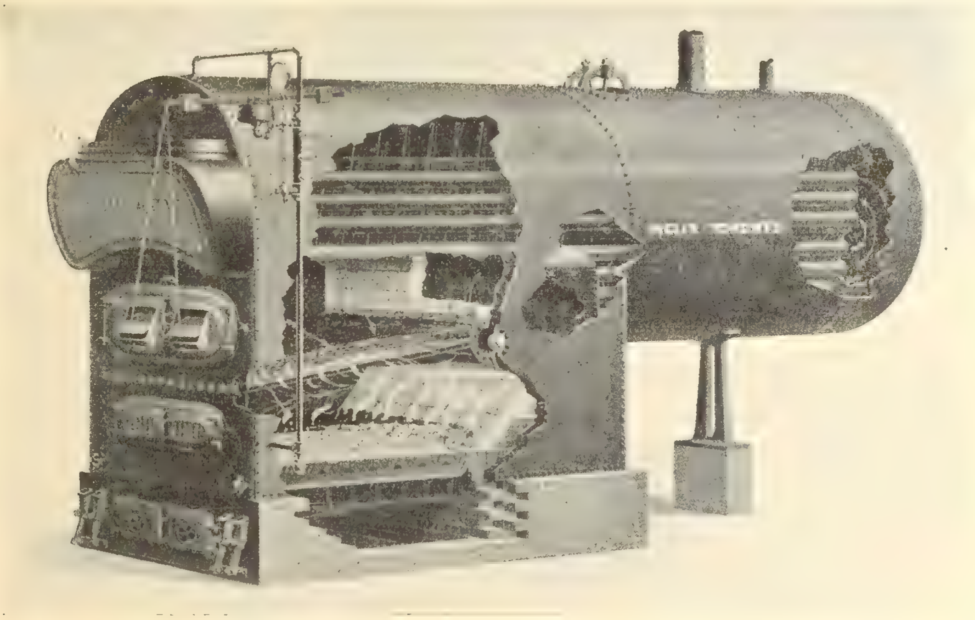
UNITED STATES FIDELITY & GUARANTY
COMPANY

THE JOHN INGLIS CO.

LIMITED

ENGINEERS AND BOILERMAKERS

ESTABLISHED 1860



BOILERS Of all types built to suit requirements.

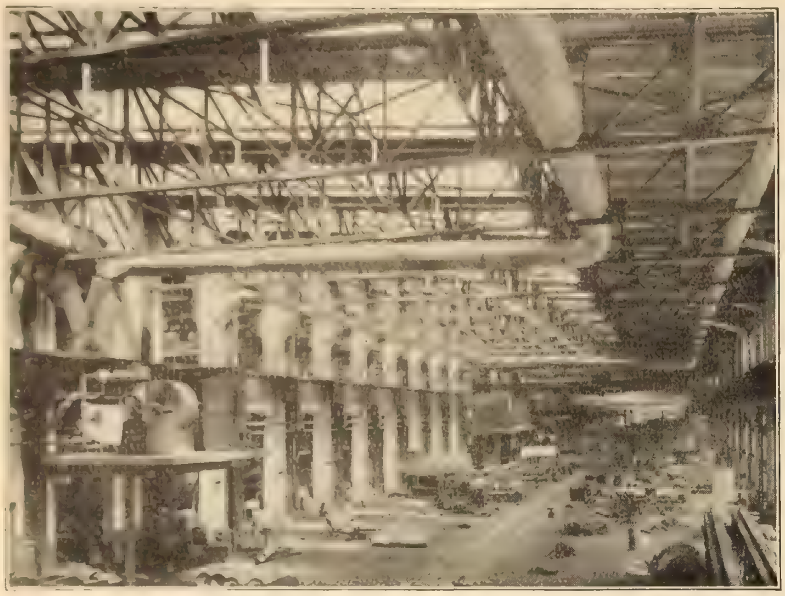
TANKS, Stacks, Water Towers, and all classes of Steel Platework.

Engines and Pumps Marine, Corliss and Pumping Engines; Centrifugal Pumps, and all classes of Special Machinery.

First class workmanship—Best quality of materials—Prompt delivery
Write us for Prices, Catalogues, etc.

Office and Works—14 Strachan Avenue, TORONTO, Canada

Montreal Sales Office—385 Beaver Hall Square



Where Experience Can be Measured in Dollars and Cents

The experience of Sturtevant Engineers has a tangible value, because their recommendations mean an actual saving of dollars and cents in plants where Sturtevant heating and ventilating equipment is installed.

Folder 606 outlines specific savings—Ask for it today

B. F. Sturtevant Company
of Canada, Limited.
Montreal - Galt - Toronto

Sturtevant
PUTS AIR TO WORK

High Pressure

In Gothenburg, Sweden, it is reported there is a boiler which operates at a steam pressure of 1,500 pounds per square inch. The steam is formed in revolving tubes—the centrifugal force assuring the contact of the water with the hot shell, and thus avoids the complication of superheated bubbles.

First Marble Importation

The first importation of marble from Guatemala, and for that matter from Central America, was made last November, when 437 cubic feet were shipped from Puerto Barrios to New York. It is claimed that the stone is on a par with, if not superior to, Carrara marble, inasmuch as it is harder, more enduring non-absorbent, and without sand holes or flint.

Plan New Tunnel

Italian and French engineers are planning to run a 2-bore tunnel through Mount Blanc for the purpose of shortening the trip by rail between Paris and Milan. This tunnel, which will be a direct competitor of the Simplon Tunnel, is to be ready for traffic within five years. It is to be about nine miles long and according to news reports, seven short tunnels on the French side and six on the Italian side are to lead up to the main passageways.

Ammonia Dynamite

Ammonia dynamite is the most common explosive used in quarry works, so we are told by Oliver Bowles, mineral technologist of the U. S. Bureau of Mines. In wet holes, gelatin dynamite should be employed. For lime-kiln operations, explosives with a high rate of detonation should not be generally resorted to inasmuch as they have a tendency to shatter the rock into small pieces that are not used in lime burning except in the rotary kiln. Dynamite of 30 to 40 per cent strength is most satisfactory. For seamy rocks some operators advocate black blasting powder, which will penetrate the seams and push out the rock masses with comparatively little shattering.

To Build Large Dry-dock

A floating dry-dock, bigger than any now in existence, is to be constructed at Southampton, England. It will be capable of taking in the largest vessels in the world, say the Majestic or the Leviathan, or bigger ships that may be built. It will be 960 feet long—this dimension not limiting the length of craft to be accommodated, 134 feet in width of opening, and have a lifting capacity of 60,000 tons.

Fourteen motor-driven centrifugal pumps, with a total capacity of 20,000 tons of water per hour, will be installed A maximum of 80,000 tons of water will need to be ejected, and it will take four hours to accomplish this. Electric current will be supplied from the shore. The dock will be equipped with many other appliances, including air compressors for pneumatic tools, pumps for fire service, electric capstans for warping and hauling, and traveling cranes for handling material and equipment.

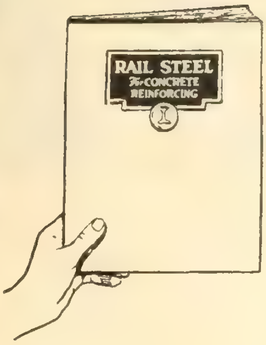
BURLINGTON STEEL COMPANY, LIMITED

HAMILTON CANADA

	Elastic Limit Pounds Sq. In.	Factor of Safety	Working Stress Pounds Sq. In.	Saving over Structural Steel	Saving over Intermediate Steel
Structural	33,000	2.06	16,000	......	.....
Intermediate	40,000	2.22	18,000	11.2%	.....
Hard { Rail or Billet }	50,000	2.56	20,000	20.0%	10%

The Strongest Bars Made

A glance at the above table shows that by using hard steel, or Rail Steel, for reinforcement the designer may use 20,000 pounds unit stress in his steel, and still have a factor of safety of 2.50, or a 25% greater factor of safety than by using structural grade steel and designing for only 16,000 pounds unit stress. At the same time he uses 20% less steel, and as a consequence considerably less concrete. He has,, therefore, designed a **safer structure** for **less money.**



Send for This Valuable Book—FREE

The first and only authoritative and comprehensive treatise on concrete Reinforcing Bars and containing most important information on the manufacture, qualities, and use of Rail Steel Bars.

If he is sure to specify Rail Steel, he will actually have a factor of safety of over 3. Several different investigations, comprising in total over 8,000 tests, have shown Rail Steel Bars to have an average elastic limit of over 60,000 pounds per square inch. Rail Steel Bars are the strongest reinforcing bars made.

Further proof of this statement, and other valuable information on both Billet and Rail Steel Bars, are contained in the booklet "Rail Steel for Concrete Reinforcing." Send for it.

Specify your reinforcing steel to meet A.S.T.M. specifications A-16-14, or equal

18

W H C Mussen & Co. 763 Craig St. MONTREAL

MUSSENS LIMITED

AN AUTO-CRANE ON YOUR JOB IS A HANDY PIECE OF EQUIPMENT

For Clam Shell or as an ordinary derrick for excavating loading or unloading cars of material

BYERS CRANES

Half-Circle or Full Revolve on Car Wheels, Road Wheels or Caterpillar Traction

Steam, Gas or Electric Power

½yd.-¾yd.-1yd

Send for particulars

We have a Complete Line of Road and Excavating Machinery
SMITH MIXERS - MARSH HOISTS - INSLEY CHUTING
Barber-Greene Bucket Loaders and Portable Belt Conveyors

MUSSENS LIMITED
Montreal Toronto Winnipeg Vancouver

MUSSENS LIMITED

"It has proven to be the best Machine that I have had on my work"

vard Revolving Sh

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an

It has proven itself to be the best mach on my work and will handle a greater yarday let me call your attention to the fact that mach ne loaded seven 7 yard trucks in 14 continued throughout the day at this keep the trucks to the shovel although the machine. The haul was of necessitated some idleness on the pa belief this shovel could have load that day had it had the trucks to

RUS

Que. — Toro
oply C

MUSSENS LIMITED

Western Dump Cars in Road Work

Heavy Road Grading in Minnesota

Western That's Why

The heavy cuts and fills necessary in modern road construction justify the use of small Western Dump Cars where the haul is too long to be made economically with dump wagons.

The size of dump car depends on local conditions —never more than 4 to [illegible] yd. capacity, the make should be **Western** every time, for the simple reason that Western Dump Cars permit greater production with less cost of maintenance than other dump cars. They will OUTWORK and OUTLAST any other dump car on the market.

Our experienced road engineers will be glad to analyze your road contract and advise you without obligation on your part.

Send for our new catalogue of Contractors' Equipment [illegible]

MUSSENS LIMITED
Montreal Toronto Winnipeg Vancouver

Mussens Limited have recently signed a contract for three pages in color in every issue of this paper for a year.

That, perhaps, more eloquently than any testimonial they could write, expresses their opinion of the value of advertising in Canada's leading publication in the construction and engineering fields.

If Mussens were a young firm or a new advertiser this decision of theirs might not have so much significance. The fact is, however, that for **20 years** an advertisement for this firm has been appearing in every issue of "Contract Record", and this increase of 300 per cent in the volume of their advertising in this one paper has been made after the most exacting test of the value of the publication.

Experience has evidently taught them that the buyers of heavy equipment in Canada read and are influenced by the advertisements which appear in "Contract Record".

Contract Record
and Engineering Review
349 Adelaide Street West, Toronto

FOR SALE

Just a few of our Special Offerings in Used Equipment

— Locomotives —

Item No. 4002— 3 "Pennsylvania" Switching Locomotives—17" x 24" cylinders—Type O-4-O Weight 40 Tons.
Item No. 4003— 2 "Montreal Locomotive Works" Saddle Tank Locomotives—10" x 14" cylinders—Type O-4-O, Weight 18 Tons each—Thoroughly overhauled.
Item No. 4005— 1 "American" Saddle Tank Locomotive—18" x 24" cylinders—Type O-4-O, Weight 57 Tons—Overhauled and reported to be in good operating condition.

— Dump Cars —

Item No. 4008—13 "Western" Air Dump Cars—16 cubic yard capacity—fitted with safety chains.
Item No. 4009—37 "Western" Air Dump Cars—20 cubic yard capacity—fitted with safety chains.
Item No. 4010—15 "Kilbourne & Jacobs" Air Dump Cars—20 cubic yard capacity—fitted with safety chains. All cars thoroughly overhauled—repaired—repainted.

— Steam Shovels —

Item No. 4000— 1 "Atlantic" Standard Steam Shovel—2½ yd. dipper—65 Ton—Class C-45.
Item No. 4001— 1 Model 60 "Marion" Standard Steam Shovel—2½ yd. dipper—70 Ton.
Both shovels have been repaired and are in excellent condition.

— Pumps —

Item No. 5000— 5 "Erie" Belt Driven Centrifugal Pumps complete—8" Suction.
Item No. 5002— 2 "Erie" Belt Driven Sand Pumps complete—suitable for 100′ head—8 inch.
Item No. 5003— 3 "Erie" Belt Driven Sand Pumps complete—suitable for 40′ head—6 inch.
Item No. 5005— 4 "Morris" Centrifugal Pumps 4 inch—direct connected to motors complete.

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CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags	per bbl.	$1.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.45
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	10.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	25.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*†	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	25 00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00**	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base	4.00 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.00 "	5.10 base	
Hoops	per 100 lbs.	5.00 "	3.75 "		
Twisted and deformed bars	per 100 lbs.	3.90 "	4.00 "	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	4.00 "	4.00 "	5.35	6.00
Structural shapes	per 100 lbs.	3.90 "	4.25 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.15	6.25
Plates—3/16 in.	per 100 lbs.	4.40 "	4.25 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.50 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.50 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
Cast iron pipe	per ton	65.00 "	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.45	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.80.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.

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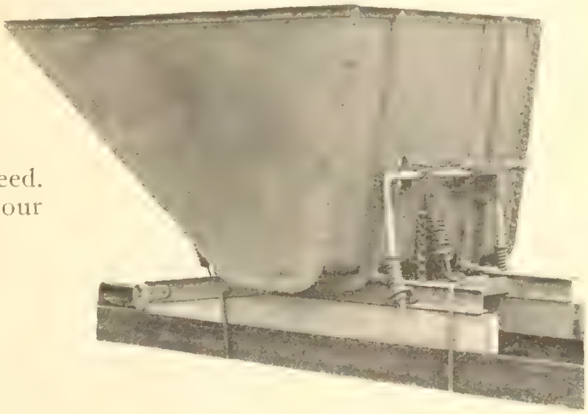

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Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	94.50	65.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	45.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	135.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	145.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.50	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	70.00

PAINTS, OILS, COLOURS (delivered):—		Toronto	Montreal	Winnipeg	Vancouver*
White lead ground in oil, less than ton lots	per cwt.	15.00	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	14.50
Putty in bulk	per cwt.	5.95	4.25	5.50	6.50
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.43	1.40	1.26	1.56
Raw linseed oil, in bbls.	per gal.	1.40	1.38	1.23	1.53
Turpentine, in bbls.	per gal.	1.70	2.20	2.50	2.80
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45

PLASTER (Delivered):—		Toronto	Montreal	Winnipeg	Vancouver*
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	26.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50

LABOR:—		Toronto	Montreal	Winnipeg	Vancouver*
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.25	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers (Common)	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Laborers (Skilled)	per hr.	.60-.70			.90
Sheet Metal Workers	per hr.	.80			

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

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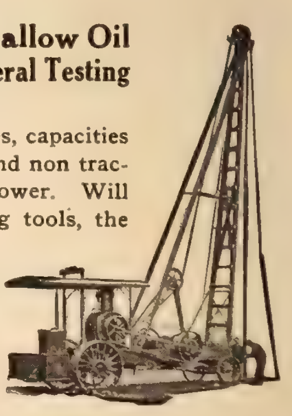

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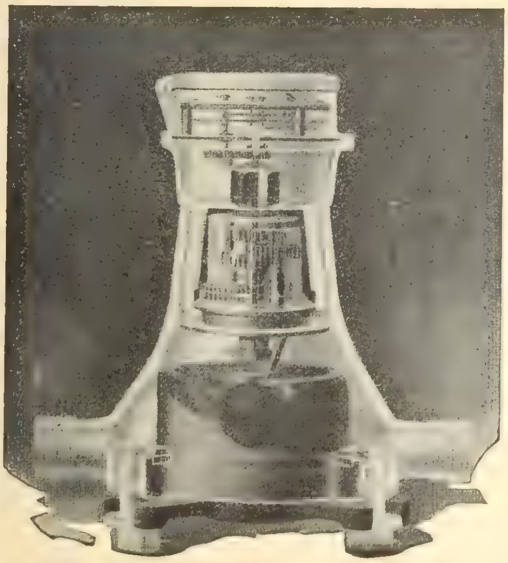

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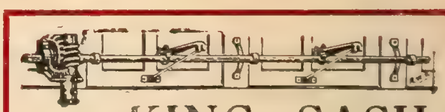

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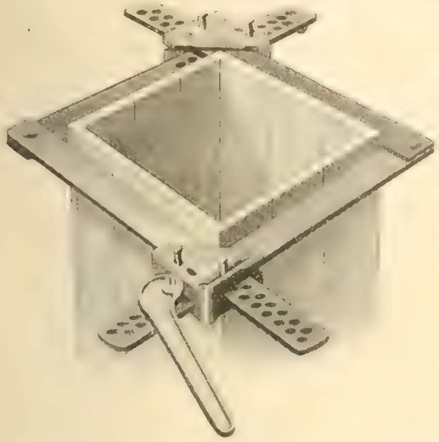

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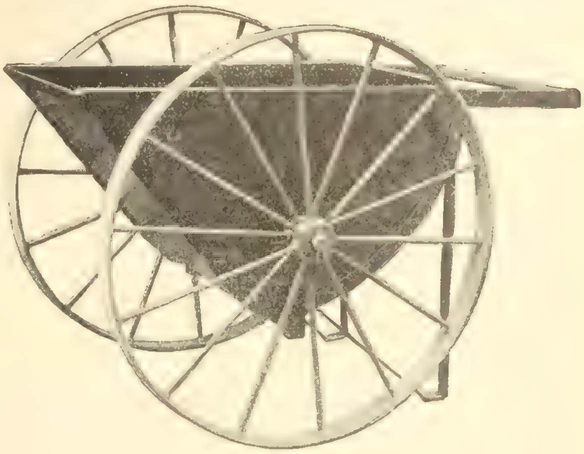

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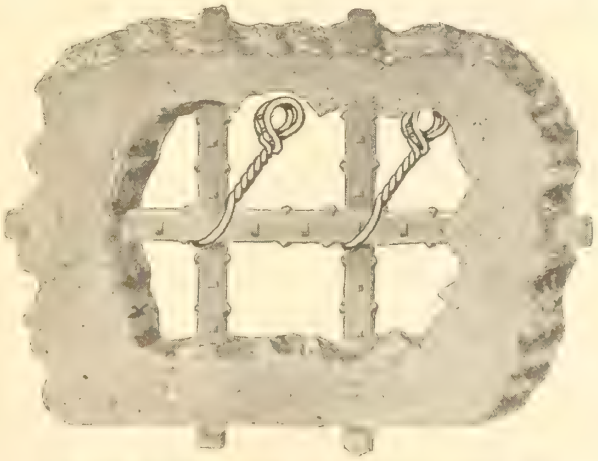

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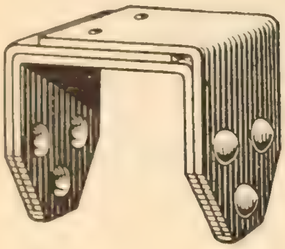
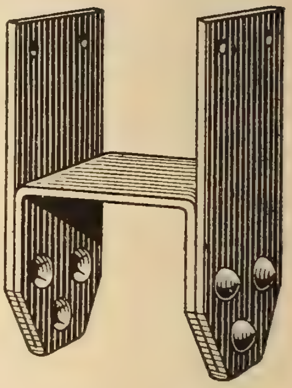


Canadian Pat. No. 216554
March 7, 1922

Bull Dog Floor Clip as manufactured and placed in soft concrete, which allows free use of floor.



Canadian Pat. No. 216554
March 7, 1922

Bull Dog Floor Clip showing top members raised to receive floor strips.

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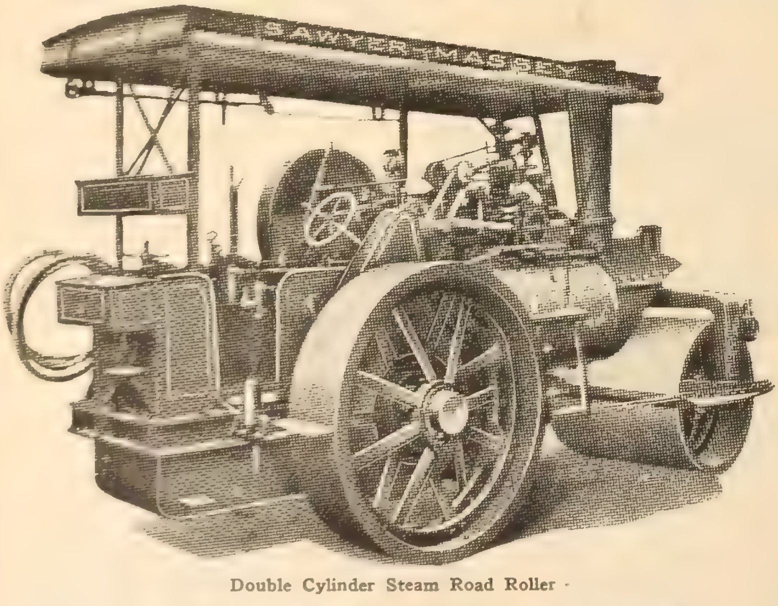

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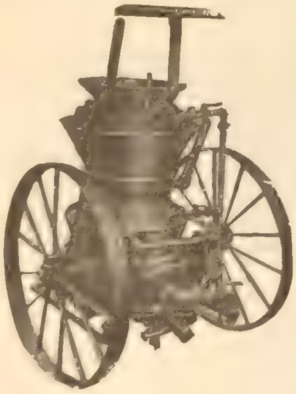

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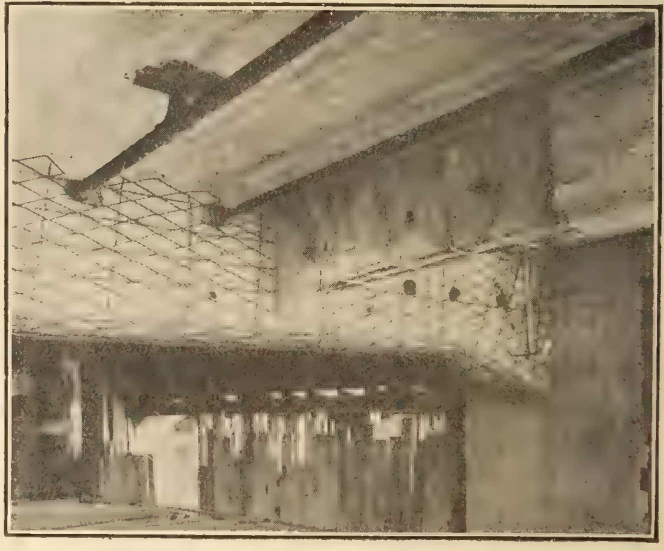

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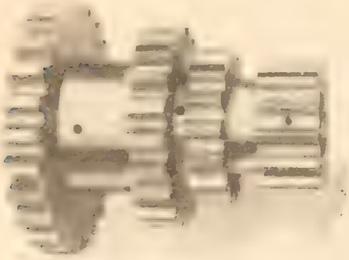

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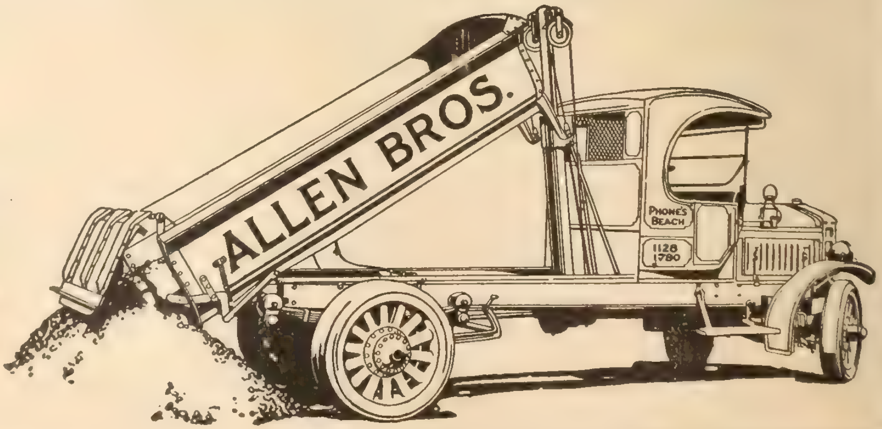

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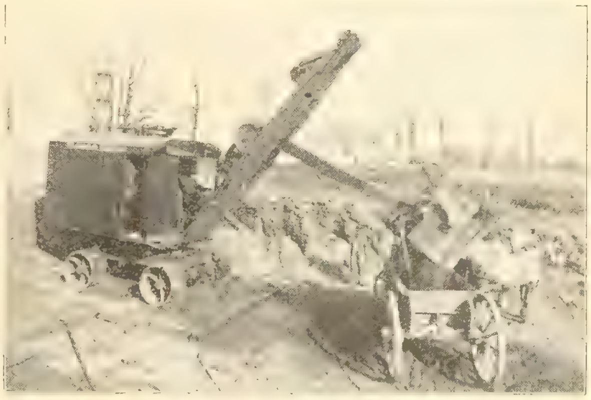

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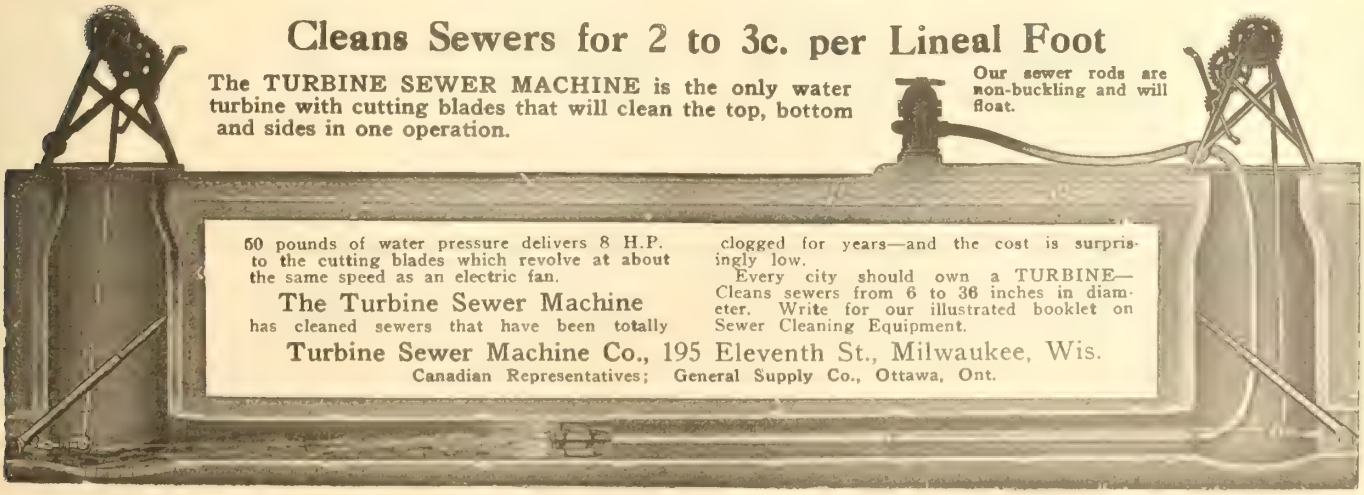

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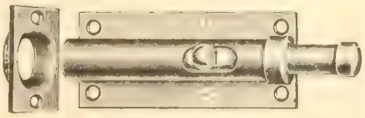

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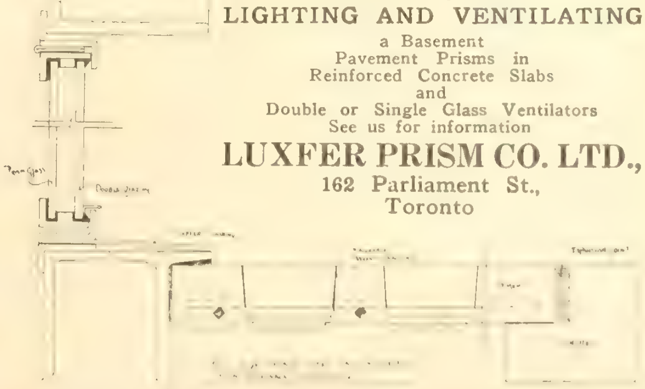

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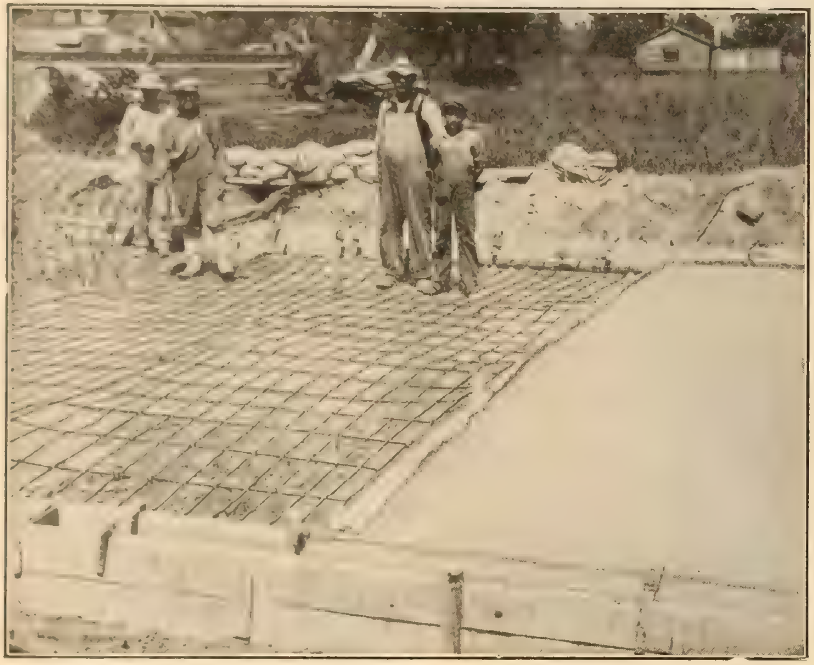

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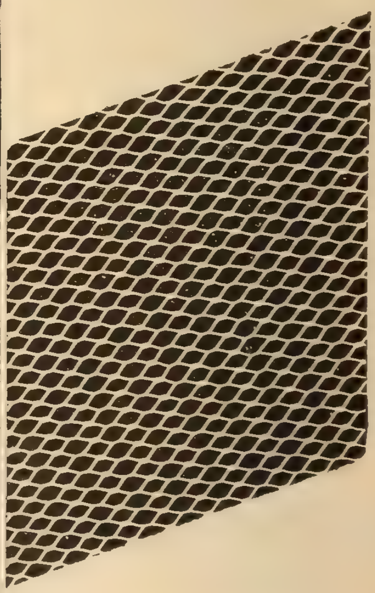

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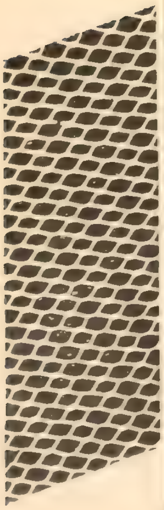

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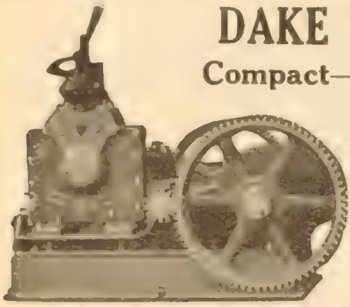

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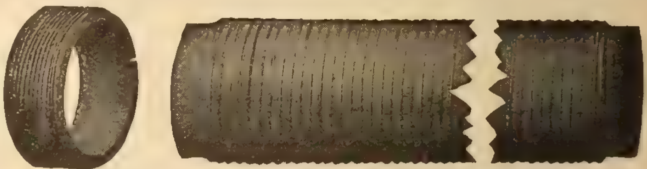
Hoists, Winches, Crabs, Motors, Fans, Blowers, Pumps, Swingers, Marine Machinery etc., etc. Air, Steam or Electric to suit your convenience.
Let us quote you on your requirements. Send for our Big Catalogue of Dake Machinery. Let our Engineers assist you in your mechanical problems.

Dake Engine Company, Grand Haven, Mich.
Canadian Office 45 Adelaide St., E. Toronto, Ont.
Capt. Wm. Stitt, Can. Sales Mgr.



Pacific Coast Pipe Co., Ltd.

Wire Wound Wood Stave Pipe
from 2 in. to 24 in. diameter

Continuous Stave Pipe
from 16 in. to 12 ft. diameter

1551 Granville Street - Vancouver, B.C.

"Galvaduct" and "Loricated"

Conduits

for Interior Construction

Conduits Company, Limited
Sole Manufacturers under Canadian and U. S. Letters Patent
Toronto - Canada

INTERNATIONAL ELECTRIC TIME SYSTEMS

Complete Electric Time Systems for Schools, Colleges, Public Institutions, Office Buildings, Factories, etc.

These comprise Master Clocks, Secondary Wall Clocks, Bell-ringing Programme Devices and Automatic Charging Cabinets. Write us for information.

International Business Machines
Company, Limited
300 Campbell Avenue, Toronto

CANADA IRON FOUNDRIES, LIMITED

"CAST IRON PIPE has the Greatest Resistance to Corrosion."

BELL and SPIGOT and FLANGED CAST IRON PIPE: SPECIALS and CASTINGS of all kinds: CAR WHEELS

HEAD OFFICE:
Mark Fisher Bldg., Montreal

Works at: Fort William, Ont., St. Thomas, Ont
Hamilton, Ont., Three Rivers, Que.

Faithful

in

Service

The safety of TURNBULL Freight Elevators is an important feature.

Each elevator is equipped, when so specified, with the TURNBULL Safety Gate which prevents accidents at the shaft door where 80 per cent of them happen.

The ideals of service which animate the whole Turnbull organization—integrity, faithfulness in trust, and honest service—are embodied in every Turnbull Freight or Passenger Elevator.

The result of these ideals combined with modern equipment and high-grade material is found in their ability to serve day in and day out without breakdown or delay. If interested, write for particulars.

The

TURNBULL ELEVATOR COMPANY

LIMITED

HEAD OFFICE & WORKS:
John st. TORONTO.

MONTREAL BRANCH:
202 Mappin Building.

WIRE ROPE

We specialize in the construction of wire rope for every requirement. Years of experience warrant us stating frankly that we offer the best to be obtained.

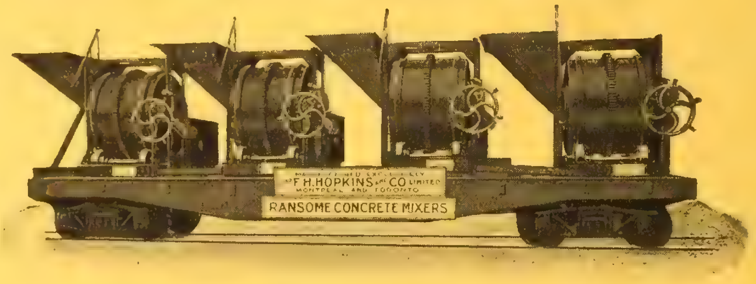
If you want wire rope that can be absolutely depended upon to give the most economical results, we ask you to specify "Dominion."

We carry a complete stock of all classes and sizes for prompt shipment.

Blocks — Clips — Thimbles — Turnbuckles, Etc.

The Dominion Wire Rope Company, Limited

Head Office: MONTREAL **Branches at: TORONTO - WINNIPEG**



Twenty-five (25) one-yard "Ransome" Concrete Mixers

Used by the

Hydro-Electric Power Commission

For the Construction of the Chippawa Creek Canal

The very best mixers obtainable were desired to carry on this important work in record time—mixers which were efficient and durable and also which could be depended upon to stand up under extreme conditions and give at all times the results that satisfy.

That is why our "Ransomes" were selected. The desired results were obtained.

Total yardage of concrete on this project was 500,000 cubic yards.

When you are considering the purchase of a mixer—will you not let us tell you just what we can promise.

Yes—'tis true—"Ransome" Mixers cost more—but—they're worth it.

We build the best we know—if we could improve them—we would do it.

Built in Canada and built right—Let us mail you details.

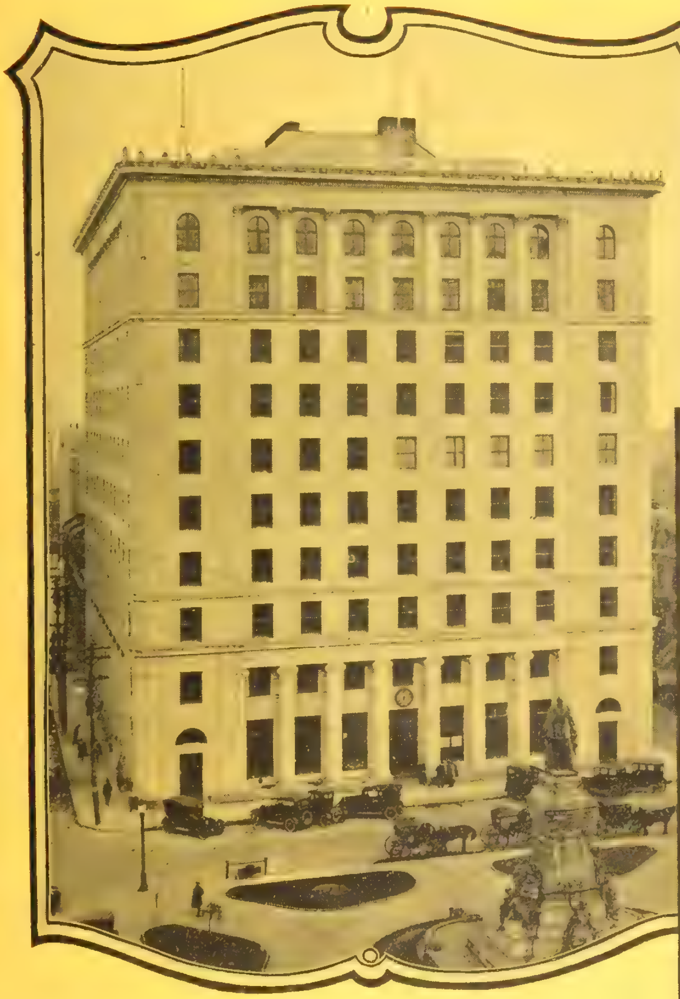
Branch:
108 Mail Building,
TORONTO
Telephone Adelaide 840

F·H·Hopkins & Co.
Limited

Head Office
MONTREAL
Telephone Main 3420

Vol. 37 Toronto, July 4, 1923 No 27

Contract Record and Engineering Review



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MONTREAL

Barott & Blackader - - Architects

Geo. A. Fuller Co. Ltd., - - Builders

Crane Ltd., - - Plumbing Fixtures

W. G. Edge Ltd., - Plumbing Contractor

Equipped throughout with—

Royal Flush Valves

SLOAN VALVE CO., LTD.

67 Adelaide St. E.

TORONTO

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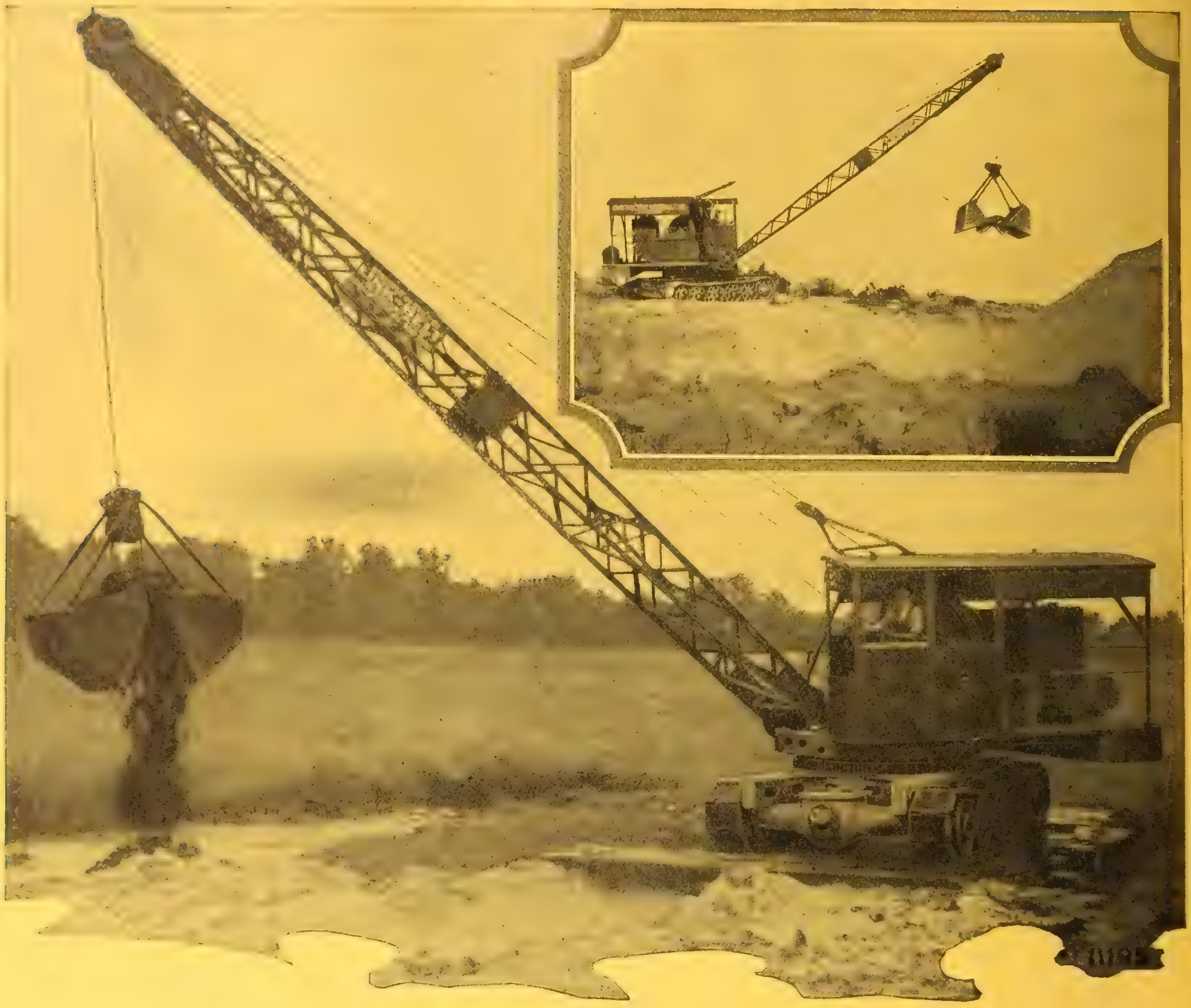


Link-Belt Quality in an All-Purpose Crawler Crane

SOUND in engineering principles and construction, durability, strength and long life—these are characteristic of Link-Belt products.

The Link-Belt Crawler Crane is no exception. It is mechanically right, easily operated by one man, and is designed for a wide range of usage.

It can make four complete rotations per minute, travels one mile per hour, and can easily climb a 25 per cent. grade.

It weighs 27 tons. Will lift 12 tons at 12 ft. radius, or 3½ tons at 30 ft. radius. Operates with any type of bucket, and can also be used with electric lifting magnet, or pile driver attachment.

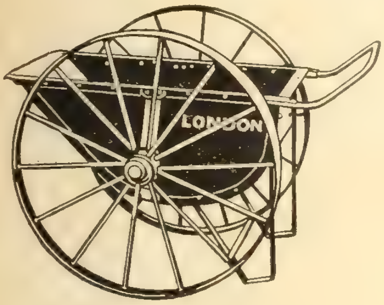
Write for specifications, price and delivery date. Send for book No. 595.

CANADIAN LINK-BELT COMPANY, LTD.
TORONTO—WELLINGTON AND PETER STREETS MONTREAL—10 GAUVIN LANE

LINK-BELT

LONDON CONCRETE MIXERS AND CONTRACTORS' EQUIPMENT

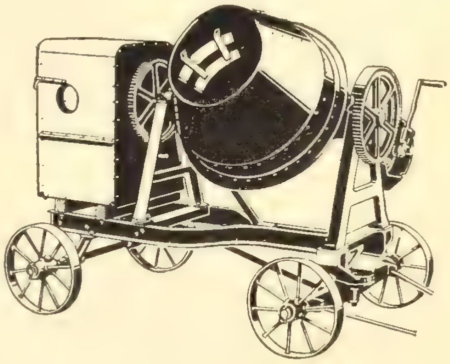
is built exclusively in Canada under manufacturing and engineering methods which are equal to any



London Concrete Cart No. 6

Our Machines are being used on important contracts not only in Canada but also in many foreign countries.

BECAUSE—we embody in each machine everything that engineering skill, modern factory methods and long experience can produce. Every machine is sold with a straight guarantee of satisfaction and is backed by a Canadian Company of strong financial standing.



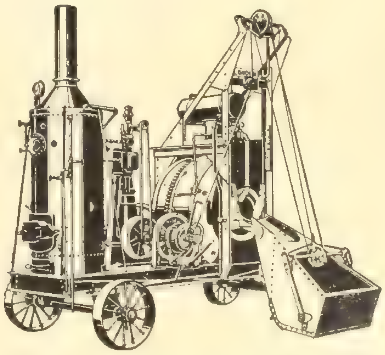
London Mixer, made in two sizes

London Mixer, made in three sizes

Our success in business depends entirely upon the success that our customers have with our machines. The enormous sale of our products is evidence that the users of LONDON EQUIPMENT are satisfied. Send for catalogue.

Made in Canada

We manufacture Concrete Mixers, Hoists, Air Compressors, Pumps, Brick, Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.



London Mixer, made in six sizes. With Steam, Gasoline or Electric Power

The London Concrete Machinery Co., Limited

Dept. 7 London, Canada

World's Largest Manufacturers of Concrete Machinery

Sales Offices and Warehouses:

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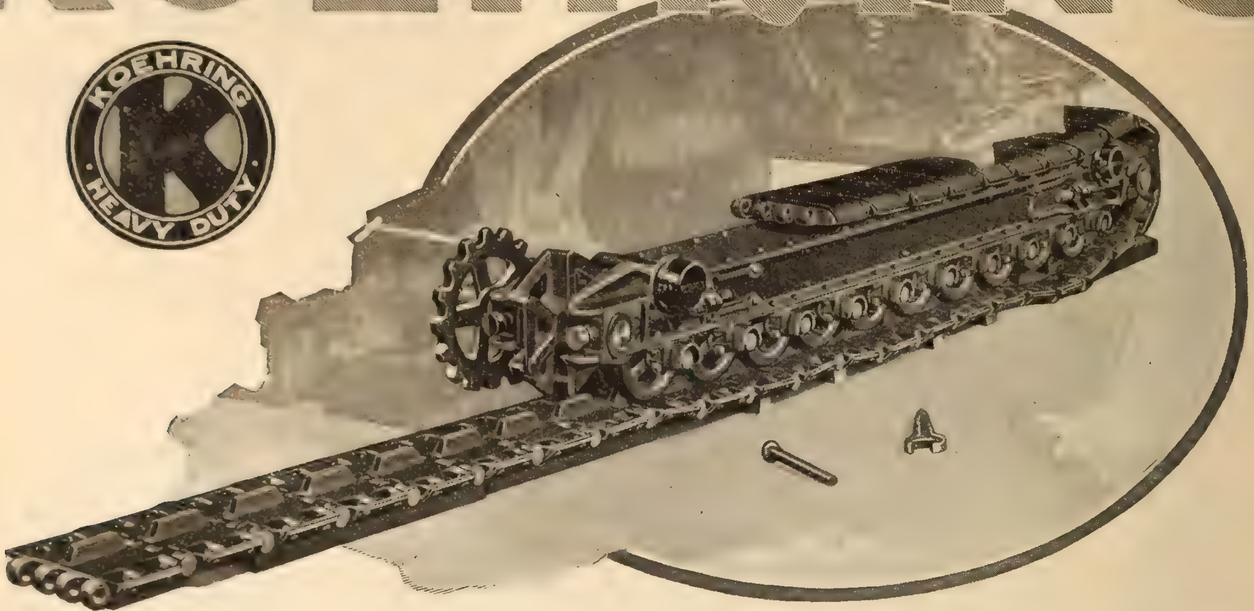
KOEHRING

KOEHRING HEAVY DUTY



Multiplane Traction with Three Point Suspension

THIS is another Koehring "HEAVY DUTY" feature not common to this type of traction.

Three point suspension which is accepted as indispensable to good mechanical mixer construction is retained with Koehring multiplane traction. Nothing but three point suspension can protect mixer frame from terriffic strains.

Liberal width planes give lowest ground pressure per square inch.

Rollers mounted rigidly in one unit, distribute strain of climbing an obstacle over all rollers —a construction that forestalls breakages.

Shoes are fastened together by four links extending the full width of each shoe — thus Koehring construction overcomes the twisting strains that are the cause of breakage.

Koehring Company of Canada, Limited,

105 Front St. East,
Toronto, Ont.
Phone: Main 1498

616 Canada Cement Bldg.,
Montreal, Que.
Phone: Uptown 3026

The remarkable accessibility of the Koehring multiplane is a special Koehring feature. Pins are easily removable.

Mixer can be jacked up and entire multiplane unit can be easily removed.

The Koehring multiplane is a measurable improvement in this type of traction — in serviceability, stand-up ability and accessibility.

Koehring "HEAVY DUTY" construction means no short cuts in construction, no slighting of the wide safety margin essential to dependability and service life.

Capacities

Construction Mixers: 10, 14, 21, 28 cu. ft. mixed concrete. Write for Catalog C. 34

Pavers: 7, 10, 14, 21, 34 cu. ft. mixed concrete. Write for Catalog P. 34

Dandie: Light mixer, 4 and 7 cu. ft. mixed concrete; power charging skip, or low charging platform. Light duty hoist. Write for Catalog D. 34

Ottawa Representatives:
E. N. & W. E. Soper,
63 Sparks St., Ottawa, Ont.
Queen 3435

PUDLO
BRAND
CEMENT WATER-PROOFING POWDER

will protect your buildings from

Water and Damp

It is the one sure means of making all cement and concrete work permanently impermeable to water, damp and oil. It slightly strengthens concrete, and improves with age. Easy to use—no extra labor.

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St. John, N.B. ....T. McAvity & Sons
Winnipeg, Edmonton, Calgary and Saskatoon........Winnipeg Paint & Glass Company Ltd.

The Largest Manufacturers of Concrete Pipe in Canada

This represents a twin 48-in. culvert with concrete wing-walls and bulkheads. It is built on a concrete foundation and replaced a fair-sized wooden bridge on the river road in Oxford Township, Grenville County, Ontario.

DOMINION CONCRETE COMPANY, LTD. Incorporated 1904 KEMPTVILLE, ONT.

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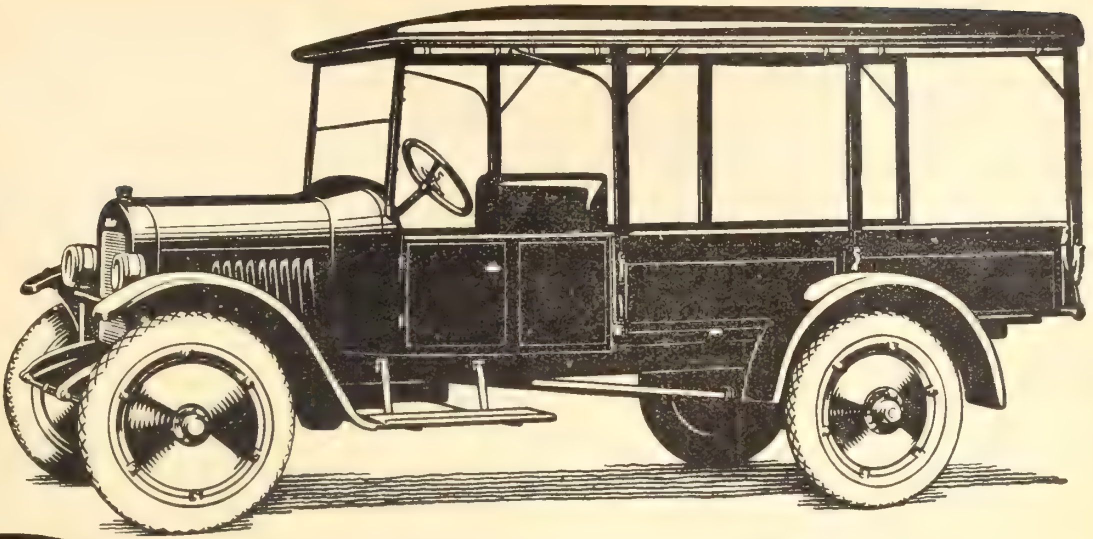
(Continued on page 8)

The New Stewart 1-Ton Truck

Bodies for Every Business



FOR

$1495

CHASSIS

Matches Trucks Costing up to $2300

Alters All Truck Values— A Simple Way to Prove It

On all major points the new Stewart one-ton truck matches trucks costing from $2000 to $2300 Check the specifications. Or better still come see and compare it with speed trucks costing from $500 to $800 more. Many important standardized parts are the same. In other features Stewart excels even these costlier trucks. The frame for instance is sturdier; bigger bearings; longer, stronger springs. Modern 5-bearing crankshaft motor. Fast, powerful, reliable. Not a one year truck. Built to last for years in steady economical duty. Deep, cushion seats for driver comfort. An examination will convince you. **With body and complete equipment the Stewart one-ton truck costs less than the chassis alone of many trucks which it will out-perform and outlast.**

Disc steel wheels—Demountable rims. Cord tires, 34" x 4½"

A Few of the Many Units in the Stewart 1-Ton Truck, Which Equals Those Used by Far Costlier Trucks

Motor—5-bearing crank shaft. Pressure feed lubricating, automatic control. Removable cylinder head and block. **Matches motors of trucks costing up to** $2300

Clutch—7 dry plate, multiple disc type with automatic adjustment. **Same as in trucks costing up to** $2300

Axles—Front, I-beam, drop-forged. **Rear, spiral** bevel gear, heavy Brown-Lipe differential. All Timken roller **bearings. Equal to trucks costing** $2300

Zenith carburetor, Remy ignition, starter, generator, Gemmer steering. **All found in trucks costing** $2000 to $2300

Cooling—Cellular type core, **pressed steel shell. Extra strong chassis frame, 6" at greatest depth. Equals trucks costing** $2000 to $2300

Stewart
MOTOR TRUCKS

Distributed by

COMMERCIAL CARS OF CANADA LIMITED
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WINNIPEG, Man.

AUTO GARAGE HAMILTON LIMITED,
69-71 Hughson St. South,
HAMILTON, Ont.

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- Canadian Link-Belt Co.
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- Canadian Pipe Co.
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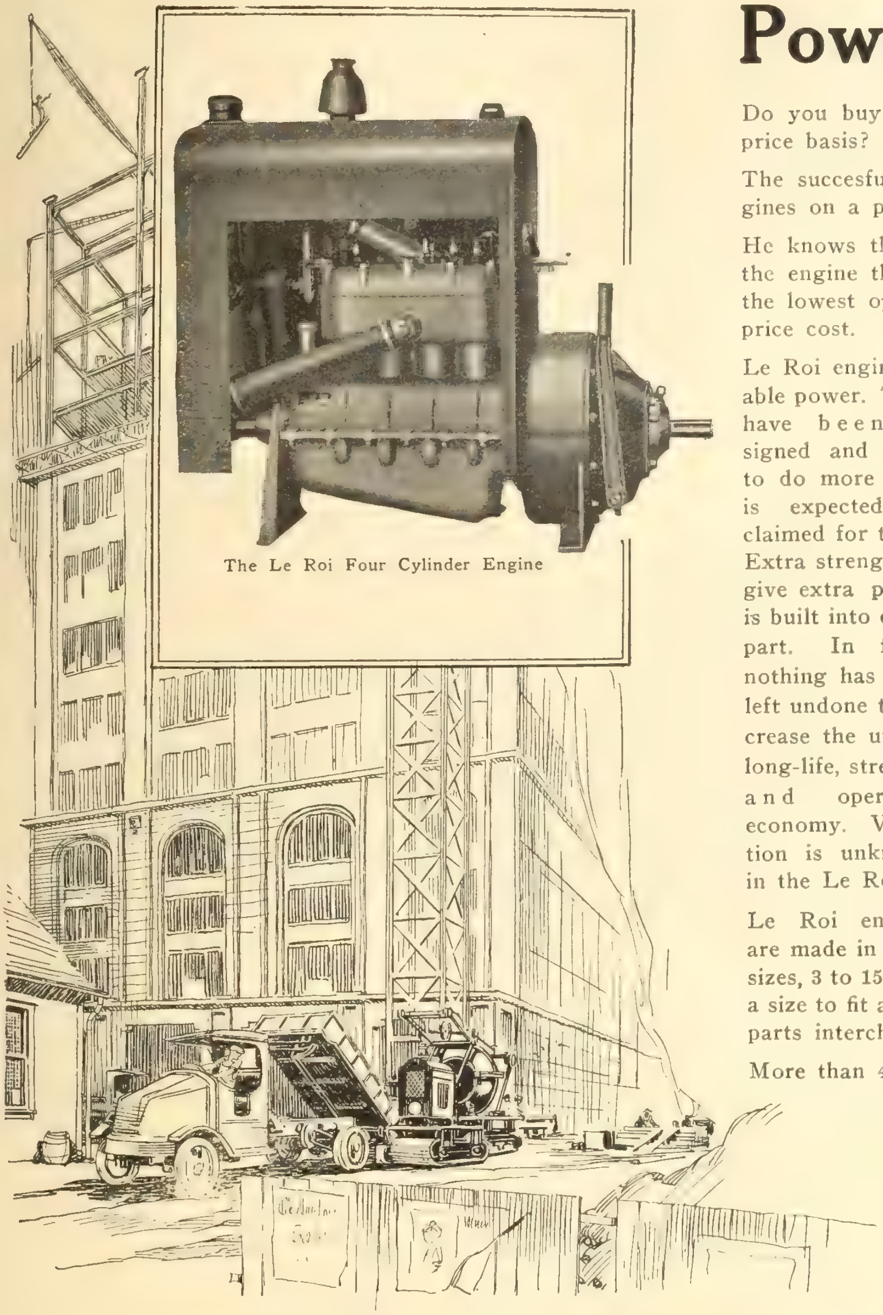
LE ROI ENGINES

Power or Price?



The Le Roi Four Cylinder Engine

Do you buy your engines on a power basis or a price basis?

The succesful contractor or engineer buys his engines on a power and serviceability basis.

He knows that engine economy lies in purchasing the engine that supplies steady, unfailing power at the lowest operating cost, not at the lowest engine price cost.

Le Roi engines have a reputation for their dependable power. They have been designed and built to do more than is expected or claimed for them. Extra strength to give extra power is built into every part. In fact nothing has been left undone to increase the utility, long-life, strength and operating economy. Vibration is unknown in the Le Roi.

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Operating the Welding and Cutting
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PREST-O-LITE COMPANY
OF CANADA, LIMITED

McCRACKEN SEWER PIPE

Is Winning Canada's Favor

A.F. Mc.Callum, Commissioner of Works, Ottawa Says:-

In reply to published criticism of the action of city council in adopting the McCallum recommendation for concrete pipe as against vitrified clay pipe. (See Ottawa Citizen April 20th, 1923.)

Mr. McCallum's letter to the Board of Control reads:-

"CONCRETE pipe is not an experiment. It was used in the United States eighty-five years ago, being imported from Scotland. It was so high in cost that after a few years clay pipe was substituted for the smaller sized sewers, but several cities have concrete pipe laid from **50** to **80** years ago.

"Brick was used in the larger sewers until the price of cement had lowered sufficiently to use concrete and in most cases brick is no longer used. Yet this same agitation was started by the same people in favor of brick about **15** years ago using the same arguments.

"The clay pipe people do not question the strength of concrete pipe for obvious reasons. The city engineer at St. Lambert, P.Q., made tests of **18**-in. clay and concrete pipe such as we are getting. The clay pipe broke at **4.610** pounds and the concrete at **11.285** pounds.

"They then base all on supposed acids, in sewage; sewage flowing in sewers is not septic and putrefaction does not take place until it reaches the disposal works or outlets. Yet these disposal works are all made of concrete and no failures have been recorded in this country."

Write for complete information and quotations

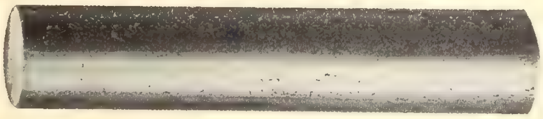
John E. Russell Co. Limited, General Sales Agents
504 Harbor Administration Building - TORONTO

McCracken Pipe is manufactured in accordance with standard specifications issued by American Society for Testing Materials for Cement-Concrete Sewer Pipe, and inspected by the Canadian Inspection and Testing Company, Limited.

McCRACKEN
SEWER PIPE
"The Pipe That Endures"

Steel Bars

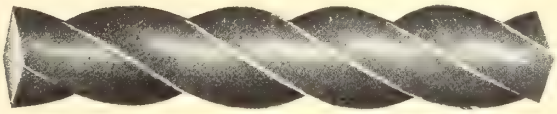
Bent and Cut as Desired



WHENEVER you are in need of steel bars for concrete reinforcement, get in touch with us. We can make prompt delivery in any quantity — ROUNDS, SQUARES, FLATS, ANGLES.

Material supplied with following limits:-
Rounds from ⅛" to 4½"
Squares from ¼" to 3½"
Flats from ½" to 6" wide
up to 1½" thick
Angles from ¾" to 4"
Annealed wire.
Nails, Washers, Spikes.

HARVARD TURNBULL & CO.
RAILWAY, MARINE AND CONTRACTORS SUPPLIES
EXCELSIOR LIFE BLDG., TORONTO ST.
TORONTO



Representatives for:
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London Concrete Machinery Co.
The Peck Rolling Mills
Pulsometer Steam Pump Co.

Information and prices gladly furnished on request.

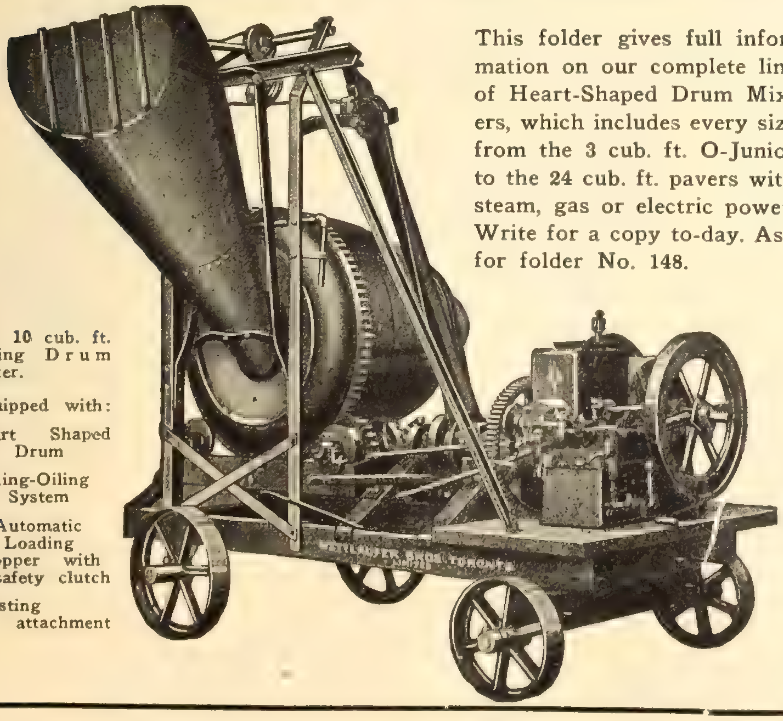
HOISTS
CRUSHERS
BLOCK MACHINES

WETTLAUFER
CONCRETE MACHINERY AND CONTRACTOR'S EQUIPMENT

Write for List of SECOND-HAND EQUIPMENT

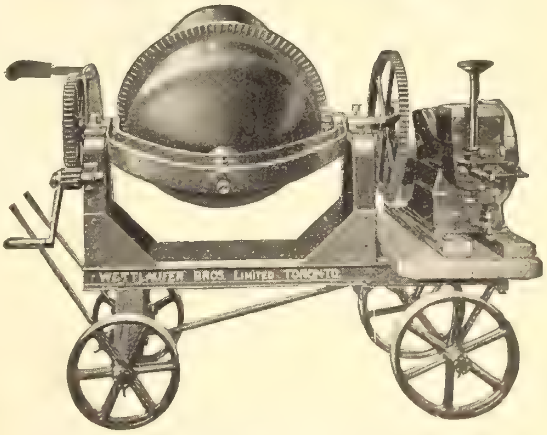
Just Issued—A New Folder on Tilting Drum Mixers

This folder gives full information on our complete line of Heart-Shaped Drum Mixers, which includes every size from the 3 cub. ft. O-Junior to the 24 cub. ft. pavers with steam, gas or electric power. Write for a copy to-day. Ask for folder No. 148.



The 10 cub. ft. Tilting Drum Mixer.

Equipped with:
Heart Shaped Drum
Ring-Oiling System
Automatic Loading Hopper with safety clutch
Hoisting attachment



The famous O-Junior Mixer—a combination mixer for cement, mortar, plaster, etc. The handiest and most popular light mixer in Canada.

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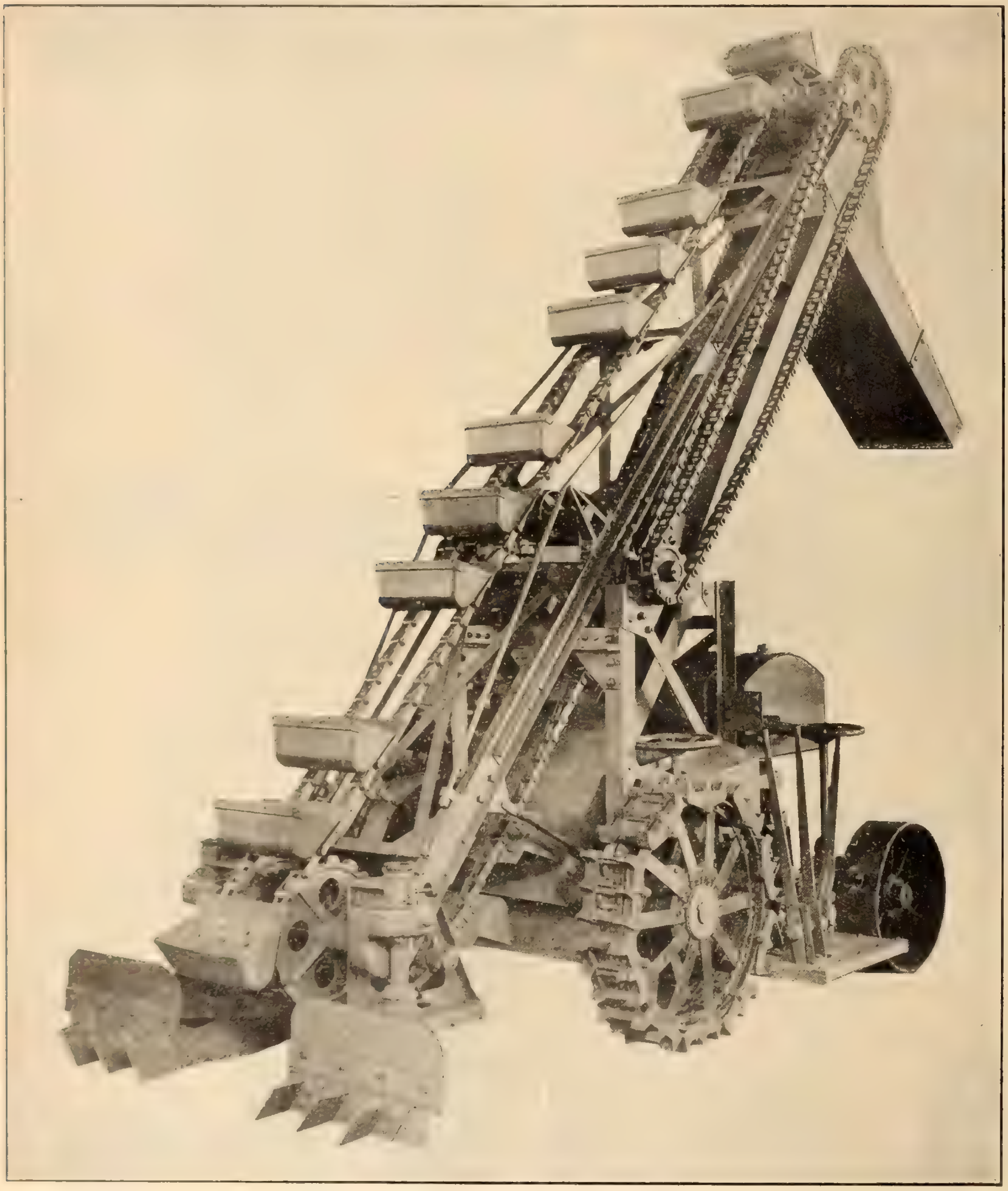

AUSTIN GRIP-WHEEL LOADER

AUSTIN MACHINERY "MOVES THE EARTH—MIXES THE CONCRETE" TRADE MARK

Austin Features

RUGGED CONSTRUCTION

POSITIVE ACTION

LARGE CAPACITY

FAST OPERATION

LOW UPKEEP

AUSTIN MACHINERY "MOVES THE EARTH—MIXES THE CONCRETE" TRADE MARK

AUSTIN LOADERS can be supplied with all multipedal traction, plain wheels, or Grip Wheels as illustrated. All are **one man** machines and all are equipped with the famous Austin Feeding Device, the most positive known.

AUSTIN LOADERS have a very large capacity, from 1 to 1½ cu. yds. per minute with a digging width of 7 ft. and a discharge height of 9 ft. 2 in.

AUSTIN LOADERS will handle loose bulk materials such as crushed stone, gravel, sand, coal, etc., at a fraction of the cost of hand work. Write for descriptive literature.

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WOODSTOCK, ONT.

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"Scooping up the Contracts"

If you have a Keystone Excavator your overhead expense is mighty low.

Take foundation digging, or ditching, for instance. Your Keystone, fitted with a Ditcher Scoop and running all day with a crew of only three men, will throw out around 300 cubic yards per day, handling practically any kind of soil, at a pace that will keep the dump wagons hustling.

And they can hustle because both they and the Keystone can stay on the level.

The Keystone can travel under its own power practically anywhere a dump wagon can go, yet its weight, 12 tons, isn't enough to break pavements or strain bridges.

The Keystone, being made in Canada, costs surprisingly little to buy, too!

A sample Ditching job by the Keystone Excavator—note the tough material, stones, etc. The Ditcher can be used for backfilling too.

Boom and stick with Ditcher Scoop reach out 26 feet and dig down with efficiency to 16 feet.

A 32 h.p. pull yanks the Ditcher Scoop up through any kind of material, ⅝ cu. yds. at a time.

When full the boom swings round over the dump wagon when the drop bottom of the Scoop deposits the material with absolute accuracy

When you have road grading to do, unbolt the Ditcher Scoop and "stick", and put on the Skimmer Scoop, then you can throw anywhere up to 500 cubic yards per day. So why buy 30 to 40 tons of big, heavy, expensive equipment when the 12 ton Keystone will do 95% of the excavation work you could quote on?

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"The Best by Every Test"

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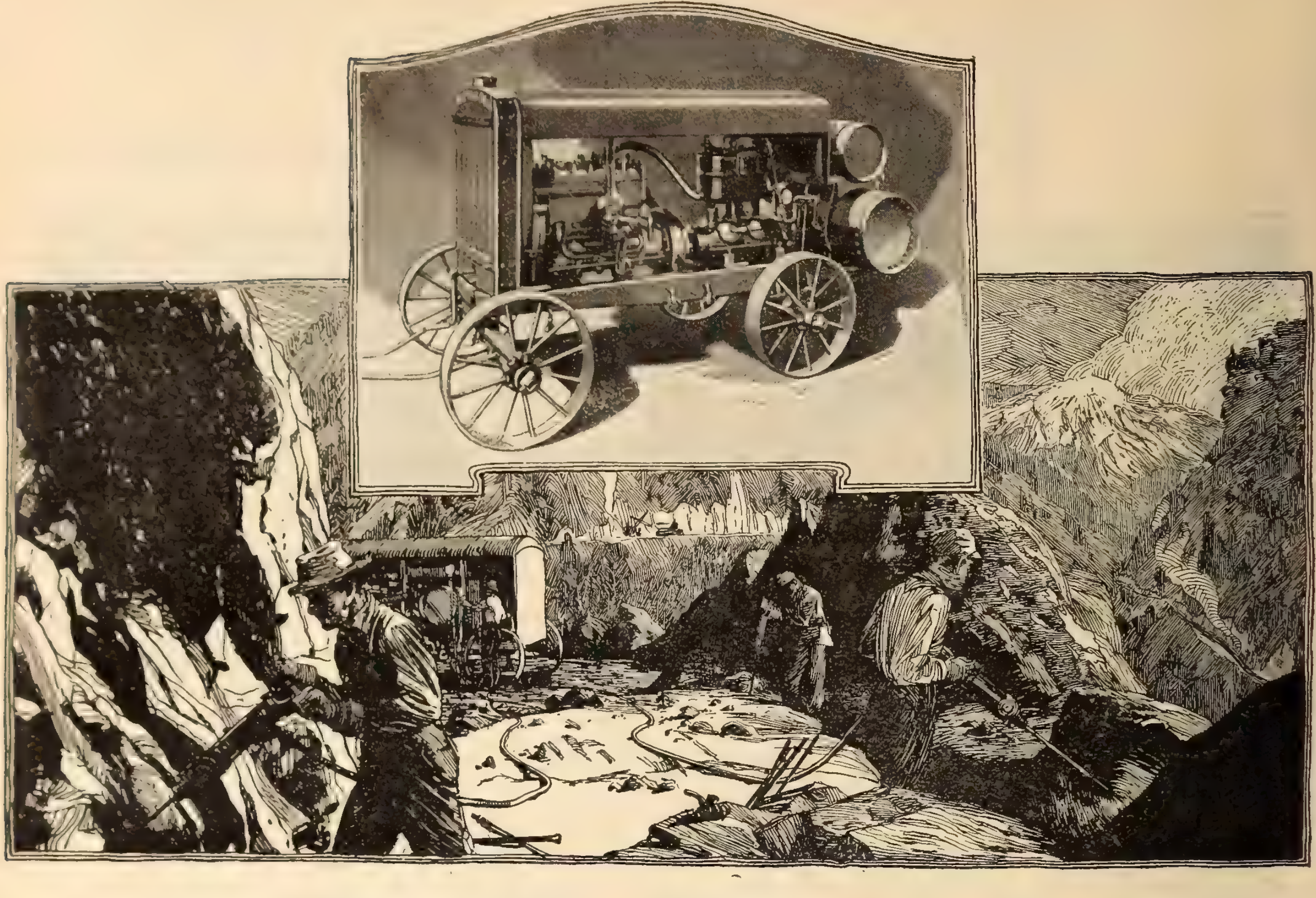

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"Ingersoll-Rand" Portable Compressors and "Jackhamers"

In the mountains and in rocky country Ingersoll-Rand Portable Compressors and "Jackhamers" are the modern trail blazers each playing its part in making—**"a neighborhood of the nation"**—through the medium of good roads.

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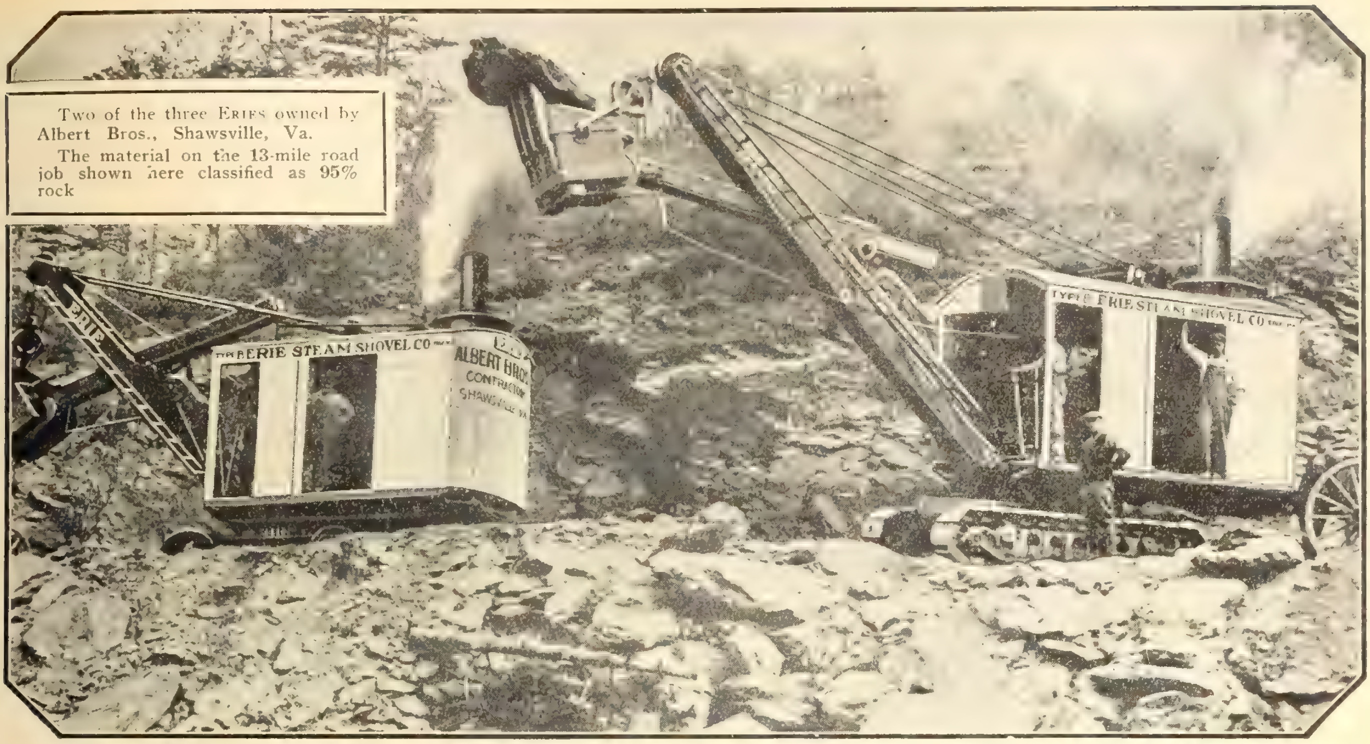

Two of the three Eries owned by Albert Bros., Shawsville, Va.

The material on the 13-mile road job shown here classified as 95% rock

ERIE
ERIE STEAM SHOVEL CO
ALBERT BROS. CONTRACTORS SHAWSVILLE VA.
TYPE ERIE STEAM SHOVEL CO

"To be sure of steady service, buy an ERIE!"—you hear it everywhere

These are just a few examples of *hundreds* of letters written by ERIE owners:

"The Erie has fewer breakdowns than any other shovel made. In two years' operation I haven't spent $10 for repairs. The Erie gives us 400 to 500 cu. yds. per day in heavy grading, and it only takes us about 3 hours to change over to a crane and unload 6 to 10 cars of material per day."—**C. G. Fuller, Dover, Ohio.** (Own 2 Eries.)

"In 8 months, we have moved our caterpillar type Erie 70 miles, and it hasn't cost a nickel for repairs. During the past 10 years I have had experience with most makes of shovels. When I went into business for myself I bought an Erie, as I am convinced from practical experience that it is the best shovel to own."—**Fred. J. Hines, Pres., Hines-McCabe, Inc., Rochester, N.Y.**

"Our Eries have been excavating for buildings for more than 8 months, sometimes nearly all rock, and we have spent nothing for repairs. We get anywhere from 400 to 800 cu. yds. per day from each. I have run practically every known make of steam shovel, and I have not seen one that can compare with the Erie."—**E. W. Cronin, Cronin & Driscoll, Roxbury, Mass.** (Own 2 Eries.)

"The Erie cannot be compared to any other machine that I have seen or used. Before purchasing my Erie I owned another shovel which I had to sell because of its extremely high upkeep cost. Grading roads and digging sewers with my Erie for a year and a half, my repair cost has been only $9.00."—**C. A. Johnson, Virginia, Minn.**

(We can send you many more such letters from ERIE owners everywhere)

Type "B" Erie Crane loading stone, and sand from storage piles to measuring bins. Owned by Fort Pitt Construction Co., Pittsburgh, Pa.

IF YOU believe that the biggest thing about any piece of construction machinery is its ability to work along month after month, without tying up the job—then the shovel that you want is an Erie. If you believe that it is most important to get the steam shovel that loses least time, you want an Erie.

We will be glad to tell where there are Eries at work near you, so you can go and look them over. We will also send our Bulletin C-16, giving full description of the Erie Shovel, with many interesting photos of it on different kinds of work. Just write us.

ERIE STEAM SHOVEL CO., Erie, Pa., U. S. A.

Incorporated 1883. Formerly Ball Engine Co.

Builders of Erie Steam Shovels,
Locomotive Cranes, Railway Ditchers

ERIE Revolving Shovels

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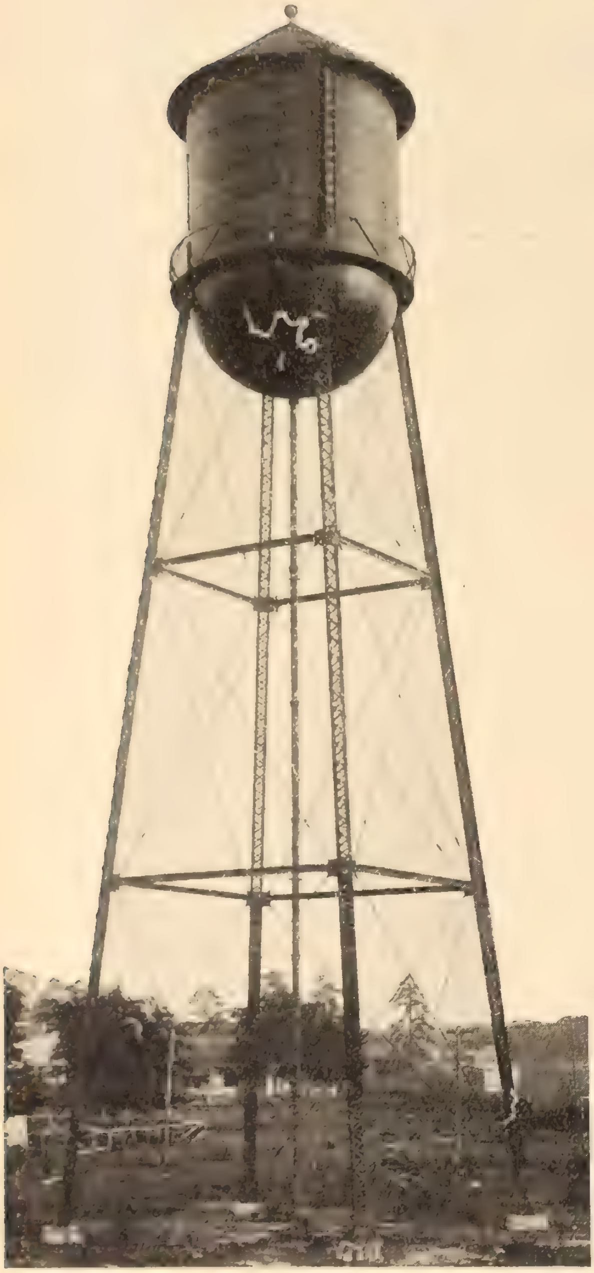
Water Towers—

A Sign of Progress



When you see the tall bulk of a Canadian Des Moines Elevated Steel Water Tank rearing above the rest of the landscape in some busy little town or vilalge, note it as a sign of progress.

The old hand-pumped wells and tin bath tubs give way to modern comfort and sanitation. Water in every house and business building, and at every corner a fire plug—guarantees of better, more comfortable, healhtful and safer living conditions. Fire no longer terrorizes greatly, for people know that with the modern gravity-flow water supply provided by the Canadian Des Moines Elevated Steel Tank there will always be plenty of water on hand, at full pressure, to halt the flames.

We specialize in fabricating and erecting elevated steel water tanks for all purposes. More than thirty years' experience in the waterworks field. Our work includes the building of complete waterworks, including elevated steel tanks, power houses, pipe lines, filters, etc. Consult with our engineers about your problem.

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CANADIAN TANKS DES MOINES
TRADE MARK

CANADIAN DES MOINES

MUSSENS M LIMITED

Windrows of scarified macadam and dirt are loaded with a Barber-Greene in Nashville, Tenn.

A Barber-Greene loading snow

Revolutionizing city paving methods

How the Barber-Greene Loader keeps down labor costs in summer—and replaces 60 snow shovelers in winter

LAST YEAR Nashville, Tennessee, removed the macadam from a certain street, and graded down the road bed an average of twelve inches in order to lay concrete pavement.

The scarified macadam and earth were plowed into windrows and a Barber-Greene Loader was put to work loading them into trucks.

In one day the Loader cleaned up 1,455 square yards of road by loading 485 cubic yards of material.

The average was 250 cubic yds. per day counting in the stops due to bad weather and the like.

The superintendent of the job writes: "We are revolutionizing city paving methods here by the use of this Loader. We have revamped our old ideas about the proper co-ordination of scarifier, scraper and trucks, and now we are the envy of contractors who have come to inspect our work."

The same Barber-Greene is also used to load gravel directly from the bank to trucks and on this work cut the overhead per yard 66%—and saved 25 shovelers.

With the present scarcity and high cost of common labor, savings like these appeal strongly to municipalities in all parts of the country.

Many already have Barber-Greenes and others are purchasing their first one this year.

The Barber-Greene Bucket Loader can be furnished with a removable boom so that it can be converted into a Barber-Greene Snow Loader in the winter.

Albany says that the Barber-Greene is over thirty times as fast as hand labor in loading snow; Chicago says that it replaces sixty shovelers; Boston L officials say that counting the saving in truck time, the Barber-Greene is equivalent to a crew of one hundred and fifty men.

Send for detailed specifications, catalog and performance records of this combination Loader for handling sand, gravel, stone, scarified macadam, and snow.

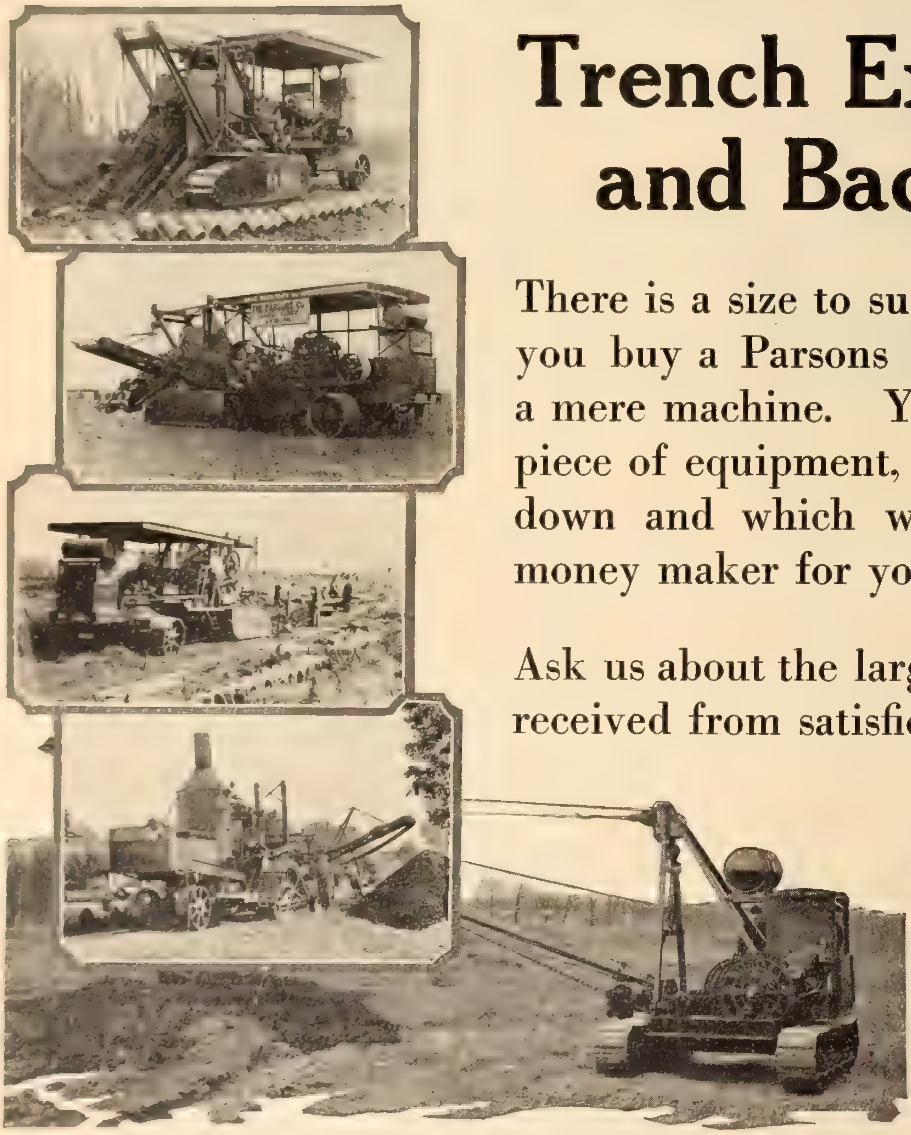
Ask our nearest office for particulars

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

MUSSENS M LIMITED

PARSONS



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Ask us about the large number of letters received from satisfied customers.

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AND

STOP PICKING

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MUSSENS LIMITED

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MUSSENS M LIMITED

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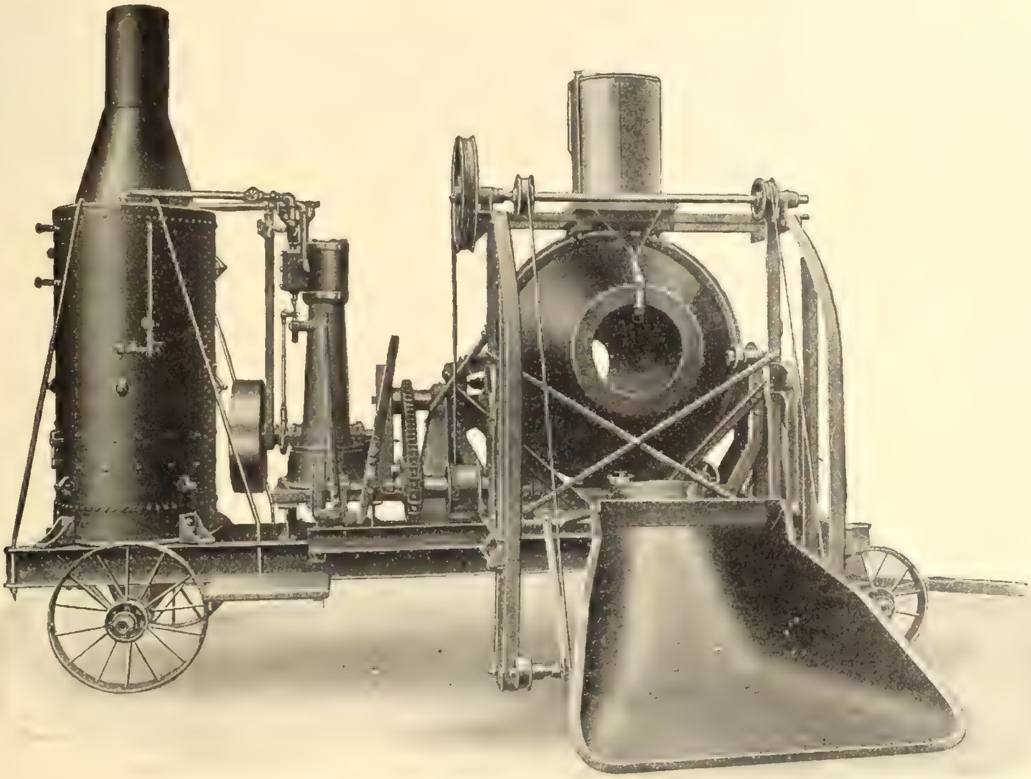
Would you not be willing to spend a little more for a **MIXER WITHOUT A BREAK-DOWN?**



SMITH MIXERS

ARE QUALITY MACHINES

Made in Montreal and
Sold to you with a guarantee

Ask our nearest office for particulars

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

Riverdale Technical School, Toronto

THE Riverdale Technical School, Toronto provided Witchall & Son with another of those jobs for which they have become so favorably known throughout the province.

As usual, the work was successfully accomplished well within the time set. No untoward delays were encountered and all phases of the work proceeded with a smoothness born of long experience and careful planning.

If this is the kind of general contracting service you like, get in touch with us and we shall be pleased to submit quotations on any work you are contemplating.

We have our own cut stone plant and specialize in buildings in which cut stone is required.

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- Earl Haig School.
- North Toronto High School.
- Hydro Station, McPherson Ave.
- Hydro Station, Eglinton Ave.
- Firehall, Commissioner St.
- Hillcrest Junior School.
- St. Martin's Church.
- Dominion Bank.
- Great War Veterans' Club House.

Past performance is a good indication of a firm's standing. Check over the list of contracts recently completed by us.

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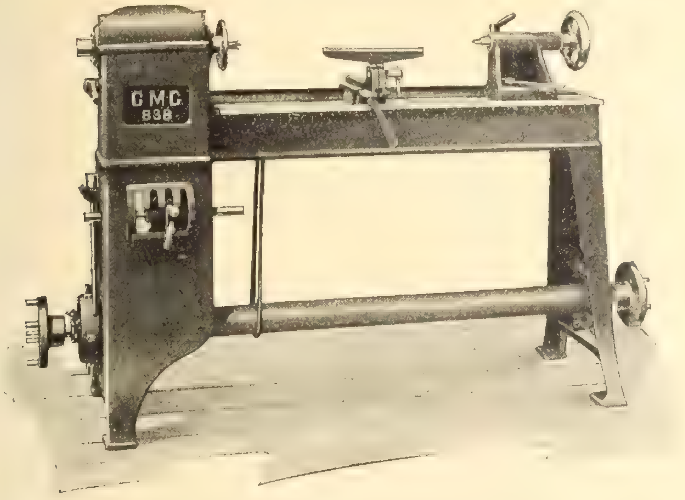
156 ST. HELENS AVE. TORONTO

C.M.C. Quality Recognized

The new Riverdale Branch Technical School, Toronto, will be equipped with C.M.C. Ball Bearing Manual Training Wood Lathes, Variety Saws, Cut-off Saws, Jointer and Hollow Chisel Mortisers.

That young mechanics should receive their training on these tools is logical as C.M.C. Machines are to be found in almost every Woodworking Shop from coast to coast, and are fully equal, in many cases superior, to anything on the market of home or foreign manufacture.



No. 838, 14″ Ball Bearing Wood Lathe arranged for group drive

C.M.C. Manual Training Machines have already been installed in numerous Educational Institutions, among which are the following: Galt Collegiate Institute, Fort William Collegiate Institute, Windsor Collegiate Institute, Walkerville High School.

Central Technical School, Toronto, Ont.
Chatham Technical School,
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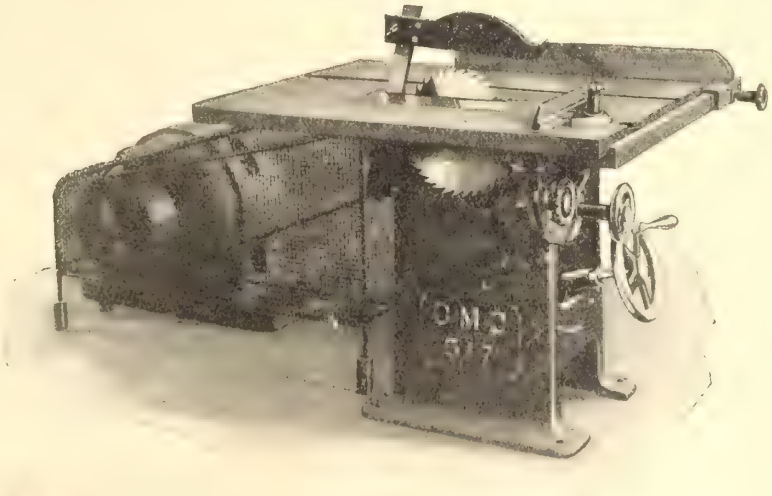

No. 617 Variety Saw, individual motor driven

CANADA MACHINERY CORPORATION
LIMITED

GALT - ONTARIO

Manufacturers of Iron and Woodworking Machine Tools.

Toronto Sales Office — — 721 Bank of Hamilton Building

Put the BULL-DOG on *your* Pay-roll

The Bull Dog Floor Clip

is the best method ever devised to hold a wood floor to concrete

Just think this over: NO CONCRETE FILL REQUIRED: USE 2 x 2 unbevelled instead of 2 x 3 bevelled sleepers.

ACTUAL MONEY SAVED by eliminating a concrete fill and by using 2 x 2 unbevelled sleepers amounts to over 4c. a square foot of floor area; and over 3c. against a cinder concrete fill.

REDUCE DEAD LOAD:—Approximately 18,000 lbs. per 1,000 square feet by eliminating concrete fill; Great Saving in reinforcing steel is effected.

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being wired and equipped by us.

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These Indicator Posts function satisfactorily and will stand the strain of severe usage so detrimental to inferior equipment.

When ordering be sure and specify depth of trench.

Jenkins Indicator Posts and the complete line of Jenkins Diamond marked Valves are pictured and described in Catalog No. 9—free on request.

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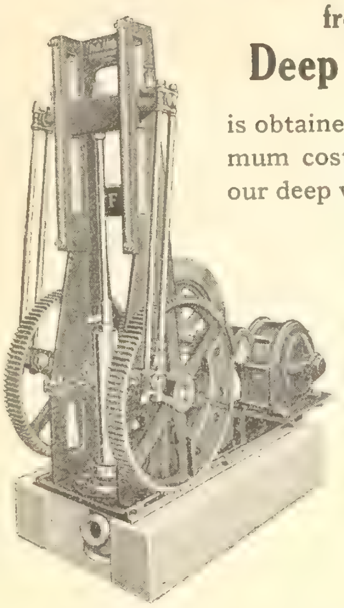
SINCE 1864



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is obtained at a minimum cost by use of our deep well pumps.

Write for Bulletin 26 explaining the use of Cook's Patent Brass Tube Well Strainer.

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30—20 yd. Standard Gauge Ballast Cars.
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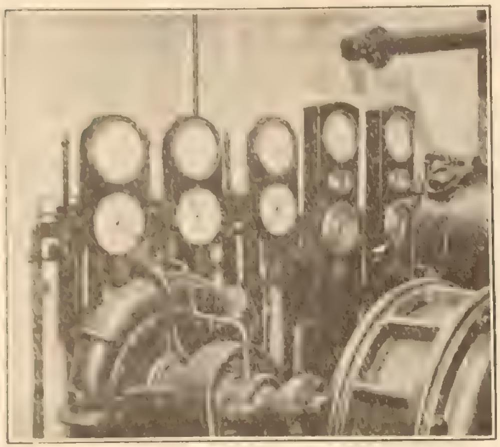

Battery of Venturi Meter Instruments at U.S. Stock Yards & Transit Co.

THE VENTURI METER SAYS WHEN TO CUT IN OR CUT OUT A PUMPING UNIT

The wide variation in demand for water during the 24 hours of a day at the U.S. Stock Yards & Transit Co., Chicago, requires a rather extensive array of pumping units. The installation consists of one 1,000,000 gallon, two 3,000,000 gallon and two 6,000,000 gallon centrifugal pumps, the discharge lines of which contain one 6 in., two 10 in. and two 18 in. Venturi Meter Tubes. The accompanying engraving shows the five Venturi Meter Instruments which are located in the pumping station.

The readings on the indicator dials of these Venturi Meter Instruments tell the Engineer the proper combination of pumps to operate to most economically take care of the required pumpage. By careful attention to the Venturi Meter readings throughout the 24 hours, the pumps in service are varied from the single 1,000,000 gallon pump to the entire group of five units, the combination in service always being the most economical for the load.

The Venturi Instruments also made complete records of the discharge by each pump on a 12 in. circular chart covering a period of 24 hours.

Have you our Bulletin 210?

Builders Iron Foundry, Providence, R. I.

Canadian Representatives:
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ALLEN GENERAL SUPPLIES LTD., Toronto, Ont.

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TANKS

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The accompanying illustration shows two of the many different styles of tanks we are manufacturing.

Our method of welding steel storage tanks is an absolute guarantee against leaking or breaking.

We build

Tanks (welded or rivetted), Steel Pipe, Elevators, Conveyors of all kinds, Steel Stacks, Steel Buckets, Dumping Skips, Screens, etc.

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Contract Record and Engineering Review

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Labor is Hanging Itself in a Noose of Its Own Making

Fortunately there has not yet developed in Canada that distressing situation in labor circles that seems to have paralyzed the construction industry in the United States. Perhaps it is because our building activity has been less impetuous and our labor somewhat saner. At any rate, we have much to be thankful for that a wholesale cessation of building operations has not developed in Canadian cities as it has in so many American centres. Mature reports that now come from the other side do not minimize at all the first rumors that appeared to be flushed with exaggeration. Indeed, as the facts become known, it seems that the early news failed to even do justice to the seriousness of the situation.

Lately the United States press, popular and technical, has been full of comments on the developments that have taken place, indicating that the American mind is seriously concerned with the undesirable situation that has arisen. Indeed, so serious was the outlook a few weeks ago, that the American Construction Council urged a cessation of building and was supported in its efforts by other public and contracting bodies like the Associated General Contractors of America. When organizations like these, whose functional purpose is the promotion of building, actually urge a retardation, there must surely be something seriously wrong in the industry.

* * *

From all reports bearing on the situation, it appears that labor must in large measure take the blame. At any rate it is almost superfluous to ask how long building can continue when mechanics are asking $25 or more per day—it cannot go on; that is all there is to it. And yet that is precisely what some classes of labor are attempting to get. The "Wall Street Journal," for example, reports that as high as $25 is being paid to members of the trowel trades in New York City, while in some Long Island towns, plasterers recently went on strike for $27 a day with double time for overtime. "Instances are known," states this authority, "where plasterers' pay has run to $250 a week." Possibly wages are higher in the vicinity of New York City than elsewhere in the United States but it seems that demands of the same calibre are being made in other centres.

When it is remembered that labor forms a very large part of the cost of construction, the seriousness of the situation is apparent. The exhorbitant demands of labor could produce no other result than that which did develop—a cessation of building; in other words, a buyers' strike. It was to forestall anything of this character that several months ago the Associated General Contractors were led to plead with the unions and building supply manufacturers and dealers to keep their prices down. When it was evident that costs were mounting in spite of protests they went even further and urged a reduction in the amount of building, believing that such a policy would avoid the crash that would inevitably follow high costs and that would reduce the industry to a state of depression from which it would be long in recovering. Apparently, this advice has been heeded, for all over the United States, building has halted to a point where it will pay labor to reconsider their demands and take wages in accord with their true worth.

* * *

In Canada, things have not reached this pass, but lest they do it would be wise to take to heart the lessons which are presented to us by the situation that has developed on the other side. So far this year building has increased to a degree that makes us very optimistic. With costs at a sane level, this condition promises to continue throughout the season, but should any untoward increase in cost take place it is to be feared that a buyers' strike of somewhat dire possibilities may puncture the boom. It is a matter that is largely up to labor. It is to be hoped that they will be alive to the duty that is expected of them.

Compressed Air in Construction Work

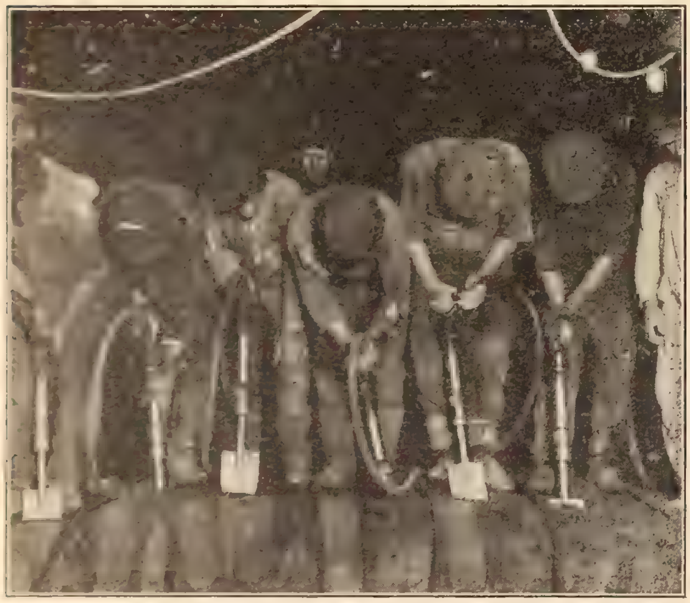
Recent Developments in the Use of Pneumatic Machinery

The First of a Series of Articles Indicating How Compressed Air Can be of Great Service to the Contractor—An Indispensable Agent that Saves Time and Money

By F. A. McLEAN

Portable compressed air operated equipment, has made the large construction project of a few years ago the short time job of today. The value of compressed air on large construction jobs has long been realized but until the advent of a reliable and truly portable compressed air plant, the cost of erecting, tearing down and moving a compressor plant prohibited its use for the hundred and one small jobs that require from a few minutes to a few days to do. With compressor plant and tools as portable as a gang tool box there is practically no job that is now too short to use compressed air to advantage.

Compressed-air operated tools, driven by air from a portable or semi-portable compressor have proved great labor savers in road work, excavations, trench and tunnel digging, pipe calking, backfill-tamping and in similar work. These air operated tools will do the work of from three to ten men, thus reducing costs, increasing the output per man and to a certain extent add to the contractors working season, by permitting work in frozen ground and by cutting down on the number of men who have to be "spelled" in cold weather. Modern air compressors, for operating these tools, have been developed, so that complete equipment can easily be secured for any job.



Pneumatic clay diggers working in a sewer tunnel heading

Pneumatic Diggers for Foundation, Trench, Shaft, Tunnel and Similar Excavations

Notable progress has recently been made in excavation work through clay and hard ground by the use of pneumatic clay diggers. These air tools were developed to take the place of the ordinary hand pick and enable the work to be carried on at a faster rate with materially reduced costs. Incidentally, they probably represent the first real improvement of the hand pick made in several thousand years.

The pneumatic clay digger makes rapid progress in wet. sticky ground or in hard dirt where hand picks are of little use

Excavation in stiff clay and hard ground, where power shovels, trenching machines, etc., cannot be used, is usually slow and expensive if the material has to be loosened for removal by hand picking. On many jobs the ground is not hard enough to be drilled and shot and yet is too hard to be removed with the ordinary hand shovel alone.

Clay diggers have been found very advantageous for such jobs. They have proved remarkable labor savers making it possible for each man to do as much work as five men with ordinary hand picks.

Machine Versus Hand "Picking"

In ordinary ground by the pick and shovel method, one shoveler serves one man with a pick. Using a pneumatic clay digger one man will loosen enough ground to keep at least five shovelers busy. In other words, the man with the air tool will do as much work as five men with hand picks. The rate will even average higher than this because the man with the pneumatic digger keeps up a uniform rate of work with fewer stops for rest, as the work is less tiring than swinging a hand pick.

An actual comparison between two sections of trench, in one of which hand picks were used, while in the other these pneumatic diggers were employed, gave the following results:

Hand Picking—10 men working 8 hrs. each loosened 64 cubic yards of clay per day. Average rate per man per day, 6½ cubic yards.

Pneumatic Picking—5 men working 7 hrs. each loosened 157 cubic yards of clay per day. Average rate per man per day, 31 cubic yards.

The above figures are taken from actual records made by a large public service company using a total of fourteen of these machines. The work on which they were employed was trench digging preliminary to the laying of a 20-inch gas main. The soil encountered in excavating the trench was clay and hard sand interspersed with many boulders, very often of large size, and occurring so frequently that trenching machines would not have been at all satisfactory.

Pneumatic clay digger starting an excavation job. The paving breaker in the background is used for heavier work

Another important application of pneumatic clay diggers in an Eastern city on an excavation for a street car tunnel showed similar savings. A dozen pneumatic clay diggers were used to replace all hand picking and with very gratifying results. It was found that the pneumatic diggers easily increased the work of the men five times and even six or seven times as compared to the progress with the hand picks.

Clay digger and motor driven loader on excavation work. One man with clay digger keeps five shovellers busy filling loader

Contractors report that their men find the tools very easy to operate because they can stand in a nearly upright position to operate while working. Also that the danger of accident to other workmen from careless swinging of the hand pick has been eliminated and that more men can be put into a given place to shovel out the loosened material, with greater safety.

Construction of Extension Handle Type Clay Digger or Pick

This tool for trench work, excavations, shaft sinking, open cuts, etc., is, briefly, an air hammer with cross-bar extension handle of suitable length. A digging blade is held in the nozzle end of the hammer by a retaining device, which also permits the blade being easily removed if so desired.

In operation the blows of the hammer drive the blade into the clay or hard ground so that it is pried loose.

The throttle, which controls the operation of the tool, is conveniently located in the grip handle so that the operator almost automatically shuts off the air as the tool is lifted from one position to another. A buffer inside the retaining nozzle takes up the blow of the hammer if the tool should be run while being lifted.

For excavation work the extension handle type of clay digger is generally used

For clay the blades are approximately "6 x 8" and of a slight scoop shape and are usually called "clay scoops." For earth they are "5 x 9," rectangular in shape, with a flat face ⅝" thick at the top and 5/16" thick at the bottom with the cutting edge beveled from the back. These are known as "flat picks."

The severe work and rough handling of the ordinary operator require a tool able to stand lots of abuse. The pneumatic clay digger must therefore be built to meet such conditions.

Clay Diggers in Tunnel Work

Pneumatic clay diggers as furnished for tunnel work are similar to those used for trench digging except that they have a short grip handle instead of an extension handle. The short grip handle is provided so that they can be used in narrow places overhead as shown in the accompanying illustration.

These tools have been used in great numbers for cutting sewer tunnels through stiff clay, hard sand and gravel and have almost entirely replaced hand picking for such work in many cities, during the past year or two.

In the city of Detroit for instance where the soil is mostly hard clay hundreds of these clay diggers have been used to help put through many thousands of feet of new sewer tunnel. In fact, records show that pneumatic clay diggers have to date been used on forty-one different jobs in that city. In every instance they have shown remarkable savings over hand methods.

Machine versus Hand Methods in Tunnel Work

Records submitted by tunnel contractors using pneumatic clay diggers show that the amount of work done per man has been increased from 100% to 150% over the rate where the hand pick was used.

In tunnel work through clay one man was able to pick from 4 to 6 cubic yards of clay per shift of eight hours with a hand pick. With a pneumatic clay digger the same man would loosen from 8½ to 11 cubic yards in the same length of time. On the basis of this labor saving and speeding up of the work, practically every Detroit contractor doing sewer tunnel work has used pneumatic clay diggers, finding that they cut the cost of doing the work at least 40%. The work there has been mostly done through ground varying from a very soft pumice-like clay to a very hard clay with pockets of sand.

Results obtained in a Detroit sewer tunnel, 10'-6" in diameter: Average soil encountered, very hard clay. Six pneumatic clay diggers used to the heading. Average rate per man, 11 cubic yards per shift. The best rate attained without using the air tools, 4 to 6 cubic yards per man per day. Under the most favorable conditions on this job a rate of 16 cubic yards per man per day was reached at times.

A comparison between hand and machine methods on the above job shows the following results:

Hand method of picking—Six men with hand picks working 8 hrs. per day handled 30 cubic yards per day. Average rate per man, 5 cubic yards per day.

Pneumatic picking—Six men with clay diggers working 8 hrs. per day handled 66 cubic yards per day. Average rate per man, 11 cubic yards per day.

Paving breakers operated by portable compressor on a Montreal street. These tools are also used for tearing up hard macadam, etc.

The increase in working rate with pneumatic clay diggers was 6 cubic yards per man per day.

Another tunnel of 9' diameter nearby furnished the following records: Soil, mostly medium hard blue clay. Four pneumatic clay diggers used in heading. Average rate of progress per day, 17' of tunnel. Average rate per man, per day of 8 hrs., 10 cubic yards. The clay on this job held up very good, no bracing or timbering being needed to hold up the roof.

Comparison of progress with two methods of picking:

Hand Methods—4 men with hand picks working

In addition to tearing up concrete pavement the paving breaker is also used on demolition work of various kinds.

Public service companies find the pneumatic paving breaker useful for manhole excavations in city streets

8 hrs. per day excavated 21 cubic yards per day. Average rate per man, 5½ cubic yards per day.

Pneumatic Method—4 men with pneumatic clay diggers working 8 hrs. per day excavated 40 cubic yards per day. Average rate per man, 10 cubic yards per day.

Increase in working rate per man, 4¾ cubic yards per day.

On still another sewer tunnel job in the same district, with diameter of 14′, the progress was approximately 12′ of tunnel per day. Four men with pneumatic clay diggers, four muckers, and one car man were used. The conditions on this job were ideal but the rate attained shows what fine results the pneumatic digger has made possible.

Pavement Breaking and Demolition Work

Many contractors consider it an unnecessary expense to cut asphalt or bitulithic pavement with pick or chisel and sledge, or break up concrete by hand. Not only is the hand method laborious but it is wasteful in that quite often the opening created is larger than occasion requires as it is almost impossible to take out an even strip to open a trench for laying pipe or conduits.

A pick and shovel could hardly make a trench as even and as easily repaired as the above, which was the work of a pavement breaker

Until lately all of this work has been done by hand, but now many companies have standardized on pneumatic paving breakers. By doing this they have reduced the cost and time of this work amazingly. One case on record shows a cost saving of about 67% and a time saving of about 75% when using machine instead of hand methods.

In addition to their principal application the "Paving Breakers" have been found very successful for tearing out brick, concrete foundations, retaining walls, culverts, factory floors, etc. Some of the accompanying photos show these machines in use.

Machine Versus Hand Method

A very good crew of eight men using hand methods will cut about 80 linear feet of 18′ to 24′ width asphalt and concrete in an eight hour day. The asphalt averages 3″ to 6″ in thickness and the concrete 6″. That means 10′ per man per day, or 50 cents per linear foot at a $5.00 wage. Three men with a portable compressor and two pneumatic tools cut an average of 300 linear feet per day. This costs about 16 cents per linear foot when wages, operating cost, interest, depreciation, etc., are all taken into consideration. That means a saving of two-thirds in cost and the work is done in about one quarter of the time.

On this job in London, six paving breakers broke up 2200 sq. ft. of concrete, 10 in. thick, in two days

The above figures are not estimated. They were furnished by a large public service company which uses four of the above mentioned outfits. They say that each outfit pays for itself every month—and their statement is backed up by figures.

These machines afford another saving which appeals to this company. It pays its men who are on this work whether it rains or shines, yet, it does not expect the men to work on rainy days. One of the officials stated that the paving breakers save them $75.00 every day it rains, because, if they were using the old hand method, there would be fifteen idle men around the shops.

Rock Excavation, Breaking Up Boulders, Etc.

Since the days when the only preparation needed for a piece of construction work was the procurement of as many husky laborers as could be used, and the provision of the simplest of tools—pick and shovel, drill steel and sledge, wheel barrow, etc.,—things have changed mightily. Today costs must be kept down and work completed more rapidly, and the preliminaries consist largely of a consideration of the extent to which mechanical means can be substituted for manual labor, and in the choice of type of equipment.

Every project that entails the excavation of rock makes an imperative call for the provision of machine drilling equipment. Only by taking full advantage of such economies can the contractor make a bid which will both secure him the work and at the same time give him a margin of profit.

On a work of any magnitude, compressed air has long been recognized as a factor of prime importance but, on the short time job and the work that moves from day to day, in days past the contractor could not justify the provision of an air compressor of stationary type. Now a portable air compressor and Jackhamers, or other pneumatic tools, place machine drilling at his service on any job, large or small.

The excavation of rock in the digging of trenches for pipe laying is a hand hammer drill job, pure and simple. The use of these little drills puts speed into the work, and brings down its cost. In a ragged trench it is easy to appreciate the easy handling of a machine such as the "Jackhamer," as it can be worked in the narrowest of quarters without incurring trouble.

For drilling in narrow trenches the Jackhamer type of tool has practically superseded the heavy piston drill

With few exceptions, the contractors rock drilling problem finds a most satisfactory answer in the Jackhamer, a light weight, self rotating hand hammer drill. This machine will put down holes to 6, 12, or 20 feet, according to its size, and yet is so easily handled that the holes can be drilled at any angle and in any place that affords a foothold for the drill runner. Jackhamers are an accepted standard, not only for the light work such as the removal of outcropping ledges, but for heavy excavation, bench work and tunnelling.

In building a highway, involving the grading of thirteen miles of mountain road, the contractor employed a portable compressor and two Jackhamers. He found that where there was a day's drilling without moving the compressor, he averaged 300 to 400 feet of drill hole at a cost of less than 5 cents per foot. Holes varied from 1 to 10 feet in depth, drilled in a hard limestone formation.

A radically different problem was offered in the making of a deep rock cut to lower the grade of a city street. The contractor first employed piston drills and later changed over to Jackhamers with the following result:

	Piston Type	Jackhamer
Number of drills	3	3
Number of drill operators	3	3
Number of helpers	3	0
Kind of rock	altered gneiss	
Average depth of holes	18-25 feet	
Daily drill hole footage per drill	70 feet	120 feet

While ordinarily operated from an independent air plant it is quite common for steam shovel operators to run a Jackhamer on steam from the shovel boiler or on air from an auxiliary compressor mounted on the shovel.

A contractor, who was working in stiff clay full of boulders, equipped each of his steam shovels with two steam Jackhamers. He estimates his subsequent drilling cost at a trifle over one cent per foot and figures he is saving a lot of money. He says—"By drilling a boulder a half-stick of powder will break it, while mudcapping requires five or six sticks. I would not call a shovel outfit complete without one of these small drills."

The exceptional jobs for which hand hammer drills are not recommended are submarine drilling, badly broken ground or very deep cuts, heavy excavation projects which can be more economically handled by tripod or tower mounted piston drills, capable of drilling very deep holes of comparatively large diameter. This drilling method permits the employment of extra heavy powder charges and the breaking of great yardage at a single blast. Notable examples of this class of work in Canada are the recently completed Chippawa Canal and the new Welland Canal, now under construction. The deep hole machines used on these jobs will drill a 5" hole to a depth of 60 feet or more.

(To be continued)

Now a Member of the Legislature

Mr. Geo. Oakley, of Geo. Oakley and Son, Ltd., stone contractors, Toronto, who was elected last week to the Ontario legislature, representing Riverdale

The new technical school on Greenwood Avenue, Toronto

The Riverdale Technical School, Toronto

A New Educational Institution Serving the Technical Training Requirements of the East End of the City—A Fireproof Building of Pleasing Design—Splendidly Equipped

Technical training is now recognized as so important an element in the education of boys and girls that special buildings and equipment have had to be set apart in important centres for the purpose of providing that type of scholastic teaching. In Canada, the Dominion government has sensed the requirements in this direction and is consequently aiding the provinces with their technical school programs. The result has been that in recent years the facilities for training the youth in the trades have grown very rapidly. In Toronto, for example, the Central School, built a few years ago, has become inadequate to meet the needs of the city as it has expanded and consequently other schools were planned. The first of these is the Riverdale technical school, serving the east end of the city. This building is just nearing completion and will be one of the most fully equipped educational institutions of its kind in the province, fully capable of giving its students a thorough training in the essentials of the technical arts and trades. A brief description of the new building follows:

The exterior was designed in a Gothic style which readily lends itself to large windows which are essential to classrooms. There are three large entrance doors, above which is a stone panel of Gothic design. Dignified steps lead to the main entrance. These steps are of dressed Indiana limestone.

The base of the building up to the level of the first floor is in Credit Valley random ashlar surmounted by a water table of Indiana limestone. Above the water table the building is faced with warm buff rug brick, trimmed around the windows with dressed Indiana limestone.

Every effort was made to cheapen the building by eliminating as much stone as possible, large cornices and other expensive stone mouldings being used as little as possible. For the same reason brick was used instead of stone which, of course, would have given the building a much more handsome and monumental effect.

The towers are simple in design and raised just sufficiently above the building to break the skyline.

The foundations are carried on firm clay, the piers, which are of concrete or brick, resting on stepped concrete footings. A continuous footing supports all basement walls.

The floor construction is all reinforced concrete, making the building absolutely fireproof. In some places plain slabs are used, while in other gypsum block fillers are employed.

To provide for long spans in the assembly hall and gymnasium steel columns carrying a steel truss roof are used. Steel girders and beams carry the concrete floor of the auditorium.

The sash in the building are all metal.

There is one particular feature of the building which might be specially pointed out and that is the large shop section which is arranged in an unusual way. There is a large construction room with all the various shops surrounding it—an arrangement which, it is believed, will facilitate the work of the shops and the putting together of the work in the construction room.

The corridors like the rest of the building are all of fireproof construction, surrounded by fireproof walls. The walls have a buff pressed brick dado for a height of 4 ft. The floor finish is concrete covered with battleship linoleum.

The classrooms have concrete floors covered with maple. The walls have a dado of buff pressed brick of special design, four feet high.

There is no wood in connection with the trim around the doors. A green glazed brick acts as an architrave, the doors themselves being of black ash and laminated pine.

The blackboards are 3/8 in. slate with neat chalk trough and other accessories.

The assembly hall seats approximately 1,000 people including the gallery, and has a modern up-to-date stage which will accommodate small playlets. The floor of this hall is concrete finished with maple. The walls of the room are imitation Caen-stone. The ceiling is panelled and simply and artistically decorated with ornamental plaster.

Below the assembly hall is the gymnasium which will be equipped with all necessary facilities including a running track framed of I-beams having their bearings in the walls and suspended from the ceiling girders by iron hangers.

The pool room, which adjoins the gymnasium, is equipped with a swimming pool of waterproofed concrete lined with white ceramic tile with green tile markers. It has a tile scum gutter and inset ladder. The floors surrounding the pool are also finished with ceramic tile. All of this tile was supplied and laid by the Italian Mosaic and Tile Co., Ltd., Toronto, who also had the contract for the terrazzo floors in the lavatories, quarry tile floors and marble lavatory partitions. All of the tile and marble are Canadian products.

The stairs are of concrete with iron railings and wooden hand rail.

The heating is of the vacuum system, tubular return boilers being used. The ventilation scheme has been very carefully figured so that each classroom is given six changes of fresh air per hour, all air being carefully waterwashed and humidified in the most up-to-date and modern fashion.

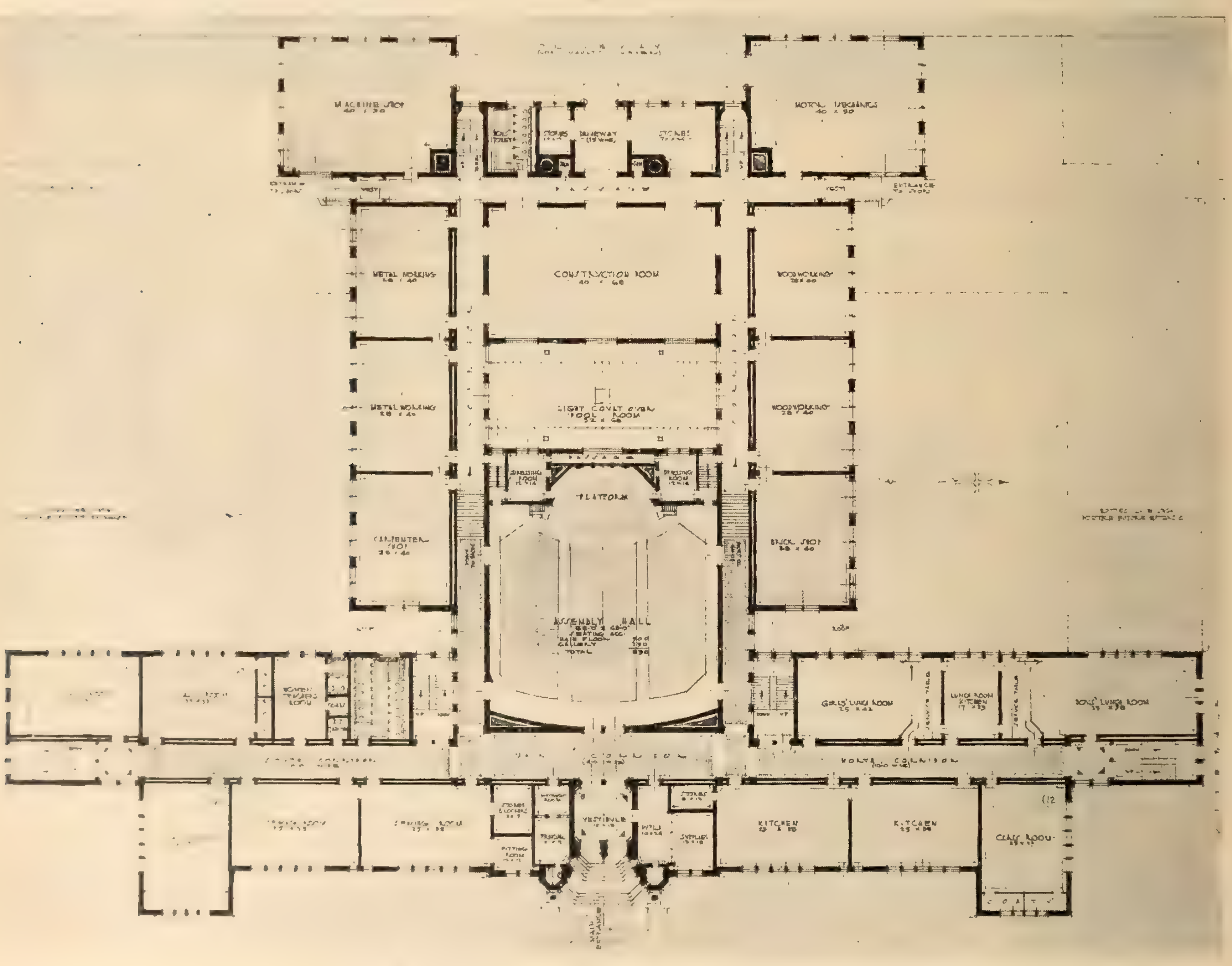
The roof is tar and gravel on 7/8-in. sheathing with galvanized iron flashings and drips. The copings on the fire walls are vitrified tile.

The electric wiring and equipment is of a high order and up to the standard demanded by technical schools. It was handled by the Canada Electric Co., Toronto.

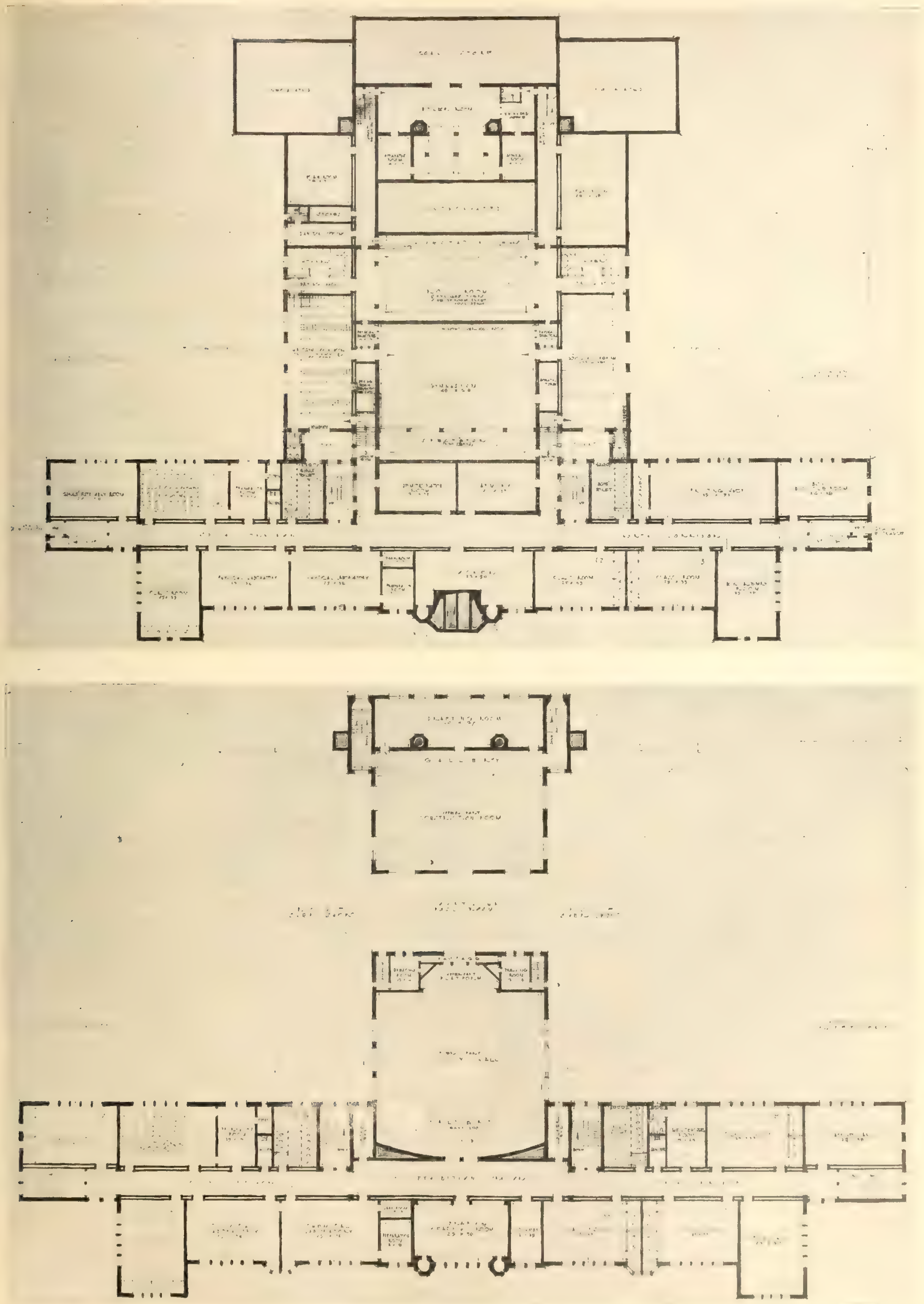
The ornamental iron work was supplied by the Dennis Wire and Iron Works, London, Ont.

Provision is made for the extension of the building as the technical requirements of the district demand.

The Riverdale Technical school was designed by the architect's department of the Toronto Board of Education. The general contractor is Witchall and Son. Other contractors are: Mechanical trades, W. G. Edge, Ltd., electric, Canada Electric Co.; painting and glazing, Hughes and Co.; ornamental iron, Den-



Plan of the main floor of the Riverdale Technical School, Toronto



Basement and second floor plans

nis Wire and Iron Co.; roofing and sheet metal, W. E. Allen Co.; plastering and lathing, Andrew Petrie; marble and tile, Italian Mosaic and Tile Co.; structural steel, McGregor and McIntyre Limited; mastic flooring, W. A. Moffatt Co.; fire doors, Fireproof Door Co. The brick was supplied by the Don Valley Brick Works; Indiana limestone by Indiana Quarries Ltd., and Credit Valley stone by Frank Rogers and Co. Steel sash were furnished by the Architectural Bronze and Iron Works; wooden doors by T. H. Hancock.

The D. McKenzie Machinery Co., of Guelph, Ont., have the contract for supplying the metal-working machinery in the new Riverdale Technical School, Toronto. The woodworking machinery is being supplied by both the Canada Machinery Corporation, Galt, Ont., and the Preston Woodworking Machinery Co., Preston, Ont. All these machines, it is understood, are to be driven by individual motors.

The equipment will cost about $144,000, $72,000 being paid by the Government and $72,000 by the city.

The cost of the building without equipment is about $500,000.

Are Odd and Short Lumber Lengths Desirable?

Several Economies Would be Possible were Lengths of Lumber Manufactured Other than the Existing Standards—Some Interests Object to the Use of Unusual Sizes

Architects, contractors, builders and home-owners are probably not generally aware that the comprehensive and sweeping program for the national standardization of lumber which has been actively under way for more than a year, following several years of preliminary discussion, is nearing completion.

Without attempting to cover the whole field of progress that has been made to date by the Central Committee on Lumber Standards and the co-operating Consulting Committee on Lumber Standards, whose determinations affect Canada as well as the United States—it is important to note that standard widths and thicknesses for yard lumber tentatively have already been determined. This action is described as a distinct step in progress toward the establishing of sound and simplified national standards for the manufacture and sale of lumber. Another subject in which the building public is vitally interested is that of odd and short lengths of lumber. This important question is now under consideration by the Practical Size Investigating Committee—a subsidiary of the Consulting Committee.

Use of Odd and Short Lengths Would Produce Economies

In explanation of the meaning of odd and short lengths of lumber it should be said that standard sizes of lumber, following long established custom, are in even feet lengths, beginning with eight feet and running up as high as sixteen. Odd lengths are, of course, the intermediate lengths of 7, 9, 11, 13 and15 feet. A varying amount of material is wasted in conforming to even lengths as, owing to defects and the taper of the log, odd lengths often result in the sawing but have to be cut off to meet standard size requirements. As for short lengths, it is plain for similar reasons that if the manufacturer makes no boards under eight feet in length much of the material is also wasted. In addition to the manufacturing wastes in both odd and short lengths it is notorious that there are huge carpentering wastes in cutting standard boards to meet building requirements where short lengths would be much more economical. It has been calculated roughly that the waste of good lumber material, because of the custom of not using odd and short lengths, is as much as ten or fifteen per cent. of the lumber content of the log. In these days of dwindling forest supplies such an item is well worth saving both from the consumer's economy point of view and the general conservation of forest resources.

According to the architects of the National Lumber Manufacturers Association the use of odd and short lengths of lumber of all kinds is a conservation measure in which all those who have at heart the best interests of timber conservation—lumber manufacturers, dealers and consumers—are concerned. Lumber manufacturers are practically interested in the inclusion of more odd and short lengths of lumber in shipments because this permits of more economical log utilization. It is apparent also that a larger proportion of odd and short lengths may suit the convenience, as well as the purse, of many consumers of lumber.

Marketing Difficulties

However, some wholesalers, retailers and consumers object to odd and short lengths. They urge that these lengths increase the cost of handling, necessitate larger storage space and more capital. Other reasons given for their opposition are that the inclusion of a large proportion of odd and short lengths in their stocks will increase overhead costs and result in a decreased turnover of stock. It seems, therefore, that the problem is not one primarily of manufacturing, but one of marketing.

If contractors, architects and consumers, generally, demand long and short lengths the dealers will naturally meet their requirements. It is, therefore, desirable to ascertain to what extent the builder can advantageously use odd and short lengths. The Practical Size Committee desires the co-operation of builders in determining to just what extent the public really does require odd and short lengths and the percentage of them that may be used in average construction as compared with the total amount used. All persons interested in this subject are urged to write to T. F. Laist, secretary of the Practical Size Investigating Committee, Conway Building, Chicago, Ill., and give their opinions and as much definite data as possible.

Mr. S. Antonini has opened a marble and tile business at Regina, Sask.

The Metal Shingle & Siding Company of Saskatchewan, Ltd., with offices at Saskatoon, has been dissolved.

Steam Shovel Produces Saving of 74 Per Cent

The Cost of a Heavy Excavation Handled by Four Power Shovels and Fifty Trucks is Estimated at $18,300—With Manual Labor it Would Have Cost $31,895

Some interesting figures are supplied by a cost study of a large excavating job in New York City—the removal of about 100,000 yds. of earth and rock from a pit measuring approximately 275 x 200 ft. and 50 ft. deep, to make way for the 22 storey building of the Equitable Life Insurance Co.

It was necessary to complete the excavation safely and with the greatest rapidity without obstructing the heavy traffic in the streets on three sides of the lot. The Thomas Crimmins Contracting Company, therefore, installed four steam shovels, a rock-drilling outfit, comprising 14 Jackhamer drills operated by air from four electrically driven compressors, and a fleet of fifty 5-ton motor trucks that handled the difficult work satisfactorily.

The shovels loaded the earth and loose stones directly into the motor trucks that entered the lot on a slope, from the foot of which they backed up to the shovels, received their loads of earth in from 1 to 4 min., and hauled them out of the pit without turning.

The movement of the trucks was well regulated, so that no congestion occurred, and there was very little waiting either by trucks or shovels.

After the removal of the earth and loose or rotten rock, the surface of the solid rock from 1 to 30 ft. below curb level was drilled. The holes, of a maximum depth of about 10 ft., were loaded with light charges of dynamite (protected by heavy wire and manila rope matresses and by chained timbers) and fired. The rock was shattered so that it could be handled by the shovels that loaded most of it into the trucks and into about 30 steel skips that in places not readily accessible to the shovels were operated by the long booms of derricks at street level, to load trucks in the street.

Careful cost figures were kept and for one of the shovels the direct average expense of operation per 8-hr. shift loading 5-ton trucks was:

Wages of shovel runner	$10.60
Wages of helper	6.76
½ ton soft coal	5.00
1 gallon oil	1.00
Water	2.00
	$25.36

The general expenses for the shovel were:

1 yoke bolt for dipper handle	$ 1.25
1 5/8 x 86 ft. hoist cable	15.00
1 set points for teeth	32.00
	$48.25

The cost of repairs was:

Cost of moving shovel 2 mi. and installing on job	$ 11.35	
Interest for 90 days on $7,570, value of shovel	113.54	
Depreciation, 6%	454.20	
General expense for 70.12 8-hr .shifts	$627.34	
General expense for 1 8-hr. shift	8.95	8.95
Total cost of operation for 1 8-hr. shift		$34.31

Steam Shovel Much Cheaper Than by Hand

At this rate, the cost of steam-shovel loading and excavating 127 loads (508 yd.) of earth in 8 hrs. was $34.31: equals $0.0675+per yard, and for excavating and loading 44 loads (132 yd.) of stone in 8 hr. was $34.31; equals $0.26 per yard.

The total cost of steam-shovel work for the entire job (which was not completed when these data were recorded, approved and verified) should therefore be estimated at:

40,000 yds. of earth excavation and loading at $0.0675=	$ 2,700
60,000 yds. of shattered rock loading at $0.26=	15,600
Total cost of excavating and unloading 100,000 yds. of earth and rock in deep city excavation	$18,300

The shovel in handling rock did the work of about 12 men and a derrick. In handling earth it replaced about 20 men digging and shoveling into the truck, or 15 men digging and shoveling into the skip or bucket on the ground handled by a derrick when the digging is easy. It also saved all drilling and blasting to shatter soft, loose and most kinds of hard earth.

If the steam-shovel work had been done by hand, with labor at $6 for 8 hr., as actually paid in New York, the cost would have been 20 x 6=$12.0 per 8-hr. shift for earthwork which cost $34.31 by steam shovel, or 3.49 times as much. The cost of the rock work, exclusive of cost of derrick service and increased cost of blasting and sledging, which would have been a material amount, would have been 15 x 6=$90 for 8-hr. shift that would have cost $34.31 by steam shovel, or 2.62 times as much.

If the whole job had been done by hand instead of by steam shovel the cost would have been:

$ 2,700 x 3.49=$ 9,323—cost of 40,000 yds. earth
15.600 x 2.62= 40,872—cost of 60,000 yds. rock

Total cost of hand excavation and loading	$50,195
Total cost of steam shovel excavation and loading	18,300
Saving by use of steam shovels for 100,000 yds. excavation and loading	$31,895=174%

An Increasing Demand for Bricks in the Old Country

F. W. Field, H. M. Trade Commissioner at Toronto, has made the following statement concerning the brick market in Great Britain, based on information which he has received from the Department of Overseas Trade in London: "The demand for bricks continues to improve,, although the impovement is more pronounced in some parts of the country than others. In the south and south-eastern districts, makers are readily disposing of practically the whole of their production. Fletton bricks are also reported to be in brisk demand. There is certainly much increased activity in the building trade, and it is only reasonable to expect that the improvement will spread eventually to other parts of the country. It is expected that house building will be more extensively carried out a little later on, and this should turn the tide so far as the brick trade is concerned. Engineering bricks should also shortly be in greater demand as quite a lot of work which will necessitate the using of this class of brick is being contemplated.

Is Another "Buyers' Strike" Imminent?

Reports indicate that such a situation has already developed in the United States, attributable to the skyward tendency of building costs. For this upward trend of prices and for the cessation of construction operations consequent upon it, labor is regarded as being largely responsible. While Canada so far has not been so seriously affected as our neighboring country, nevertheless contractors are seriously concerned. For this reason this article is intensely interesting and illuminating. It has been compiled from various authorities by "The Industrial Digest."

When you are dining at the Ritz, and notice that the florid gentleman at the next table is a little unfamiliar with the clubs used in playing the nine-course dinner, do not hasten to conclude that he is a prospector recently returned from the Labrador gold fields. He may not even be the retired cattleman that he resembles. More than likely he is the bricklayer who helped to build the apartment that is going up next door.

For today there is no such thing as common labor. If you are a contractor you know the bitter truth of these words. If you are not, harken to the writer in the "Wall Street Journal," who says that labor in the building trades is now receiving the highest wages in history:

"While the union wage scale varies between $9 and $10 a day for the various trades, the actual minimum paid is $12, the ruling rate being $14 to $16 a day (in New York City).

"As high as $25 is reported as being paid to members of the trowel trades in the environs of New York City. In some Long Island towns plasterers recently went on strike for $27 a day. Double time is also demanded for overtime. Instances are known where plasterers' pay has run to $250 a week."

This same condition exists, though in varying degree, in every section of the country. Wages on the average are approximately 155 per cent. above the 1913 level. This figure is estimated on an average $14-a-day wage in the New York district—a fair figure according to contractors' reports. According to "Boston News Bureau," building trade labor is only 85 per cent. as efficient today as in 1913.

"Decreased efficiency is ascribed to various causes. During the war period requirements for admission to the labor unions were not severe, due to the lower calibre of men then available. Another reason is the psychological reaction of the laboring man under improved conditions. It is a matter of economic history that every wage increase has occurred at a time of booming business, and has been followed by curtailed efficiency."

Contractor Pays 200% More for His Labour

Other estimates place the efficiency of building craftsmen on a much lower scale than this, but on the basis of 85 per cent. of the 1913 day's work, the contractor is today paying more than 200 per cent. more for completed work than at that time. Union rules, intended to reduce the amount of work accomplished in a given period, have been more effectively executed in the building trades than in any other.

"In matters of commerce the fault of the Dutch
Is giving too little and asking too much—"

and the labor unions, judging by this standard, must hail from Holland.

For the last three months wage advances have been actually too numerous to mention. Out of 60 representative cities, 27 report increases in one or more trades for April of this year. The number of raises, counting every trade raised in each city is 208, states "The American Contractor." Some cities report complete upward revisions. Advances in the union scale are only used, however, as a basis on which to demand a bonus, for in the larger cities at least, where the greatest volume of new building is being undertaken, practically all building labor is receiving a substantial bonus above standard scale.

And when the large part that labor plays in the cost of construction is remembered, the seriousness of the situation is apparent. According to Frank Mann, Commissioner of Tenement Houses in the City of New York:

"Labor in its complete analysis is now 85 to 87 per cent. of the cost of building, when one considers the labor necessarily put into material before it is delivered."

Is the demand for new building responsible for this unfortunate situation? Or is the speculator's greed for quick profits responsible? "Several factors are contributing to the postponement and abandonment of construction," we read in the "Brick & Clay Record":

"The 'snow-balling' of wages is the greatest of these factors. Building craftsmen are demanding excessive wages, and the shortage of men is so tremendous that wages scales have very little significance. The tradesmen are paid according to how greatly the contractor is in need of them. It is also true that there has been some increase in the price of building materials, but these advances, with few exceptions, have been very moderate. Failure of the railroads to handle full requirements of building materials has caused a scarcity in some instances which has boosted dealer prices.

"Architects are advising their clients to postpone construction, and banks are drawing tight their lines on building loans. These are additional causes for the drop in construction volume."

In the "New York Commercial" we read that "the willingness of 'speculative' builders to pay excessively high wages in order to steal a march on competitors furnishes a new illustration of the fact that it is the reckless buyer who is responsible for excessive movements in the business cycle rather than producers and manufacturers."

"There is feverish haste to make sales or get tenants in before the speculative bubble bursts," says the "New York Times."

High wages in the building materials industries have no doubt been responsible for the rapid increase in material prices. Recent figures prepared by the "Bankers Economic Service" show that material prices range from 73% above the 1909-1913 average in the case of hemlock lumber to 219% above that level in the case of common brick. Plain white oak is 156% higher than the pre-war price, portland cement 122% above that average, and steel beams 82% higher.

One result of the high prices for building materials has been the refusal of the supply dealer, and in some cases of the manufacturer, to ship goods ordered in January when they could get plenty of orders to fill at the higher April or May figures. Another result which may be, in part, the aftermath of the refusal just mentioned, is the enormous duplication of orders to insure delivery. Says "Cement and Engineering News":

"The president of one of the great cement producing concerns states the situation in these words: 'We have noticed, time after time, that when cars are short or other causes interfere with deliveries, dealers' orders are immediately swelled, in some cases to two or even four times their requirements. A contractor requiring two cars of cement per week for a specific job will, when deliveries become slow from the company with whom he has placed the order, place similar orders with two or three or even more companies. This makes an apparent demand very much greater than the actual demand. All the cement he can use in the work is two cars per week and, when he receives deliveries to this extent, he cancels or defers shipment on the excess purchases.' The Federal Reserve Bank of Cleveland comments on this situation: 'Production was led astray by this practice a few years ago, but we believe it will be on the lookout for any repetition of this sort of thing.'"

Producers who supply the construction industry with materials may, therefore, suffer heavily if such duplicated or triplicated orders are on their books when the boom is punctured and demand falls off.

And there seems to be no doubt that the building boom has been affected to such a point that the "exhorbitant demands of labor have punctured it."

"What has happened, or is happening," says Walter B. Brown, writing in the "New York Commercial," "is that building costs, because of the advances in labor and materials, have reached a point where apartments cannot be rented at figures sufficient to insure an adequate return on the investments, while dwelling houses cannot be sold to prospective occupants at a price high enough to cover the cost. In other words, there is the beginning of a buyers strike in the building industry."

A Building Buyers Strike

The facts seem to bear out the contention. There certainly is a buyers strike.

"In New York, overcrowded Columbia University defers $10,000,000 of urgently needed construction," says "Barron's Weekly." "The Hebrew Orphan Asylum postpones a $4,000,000 extension. New York Telephone Company, still pressed for new phones, will stop at foundation work on its new $11,000,000 central building. Thompson-Starrett Company halts $7,000,000 worth of work. The Statler Company holds up plans for Boston and Detroit hotels to cost $12,000,000. Such deferment in two days . . . in New York totalled $25,000,000, since the first of the month, $75,000,000 out of a $350,000,000 program for the balance of 1923. The national total of deferment must be many scores of millions."

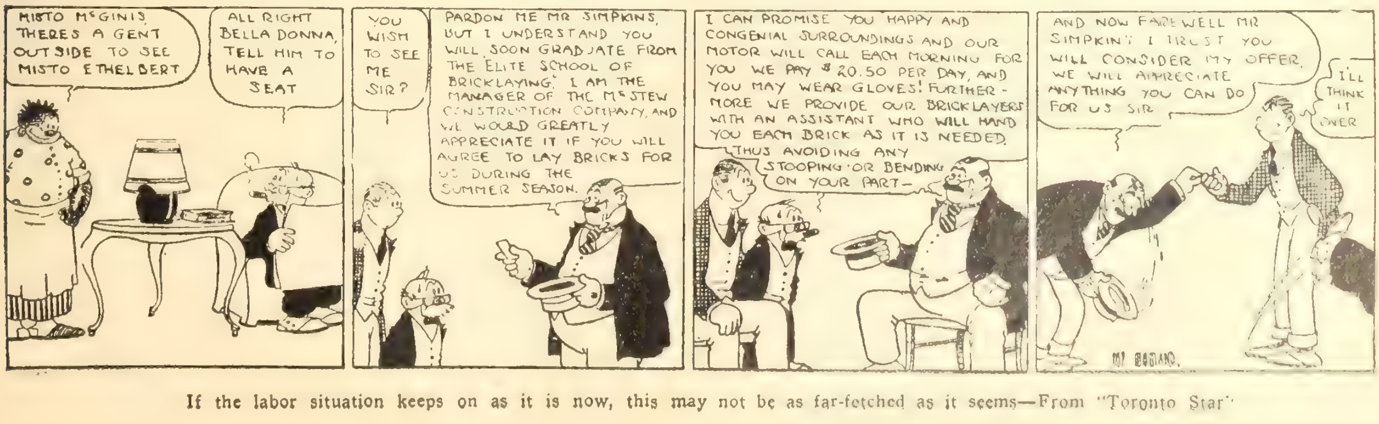
Reports from Chicago, St. Louis and San Francisco state that a similar situation exists in these sections, and it may be said that the strike has spread very rapidly over the entire country. At the direction of President Harding, Secretary Hoover made an investigation and recommended that no new Government construction be undertaken, and that work in progress be reduced as much as consistent with economy of construction and actual urgent need until private requirements have been met.

A buyers strike and a recurrence of the depression of 1920 and 1922 is foreseen by E. S. McClelland, of the Westinghouse Electric Co., Pittsburgh.

"Prices of construction materials have stopped building projects in the Pittsburgh district," he said. "Cost of material and labor has advanced so high that important construction work that should be undertaken is at a standstill, and I expect to see this condition spread."

"Building cannot go on at present prices," said

KEEPING UP WITH THE JONESES—ETHELBERT'S FUTURE IS ASSURED. —*By POP MOMAND*


MISTO M^cGINIS, THERES A GENT OUTSIDE TO SEE MISTO ETHELBERT
ALL RIGHT BELLA DONNA, TELL HIM TO HAVE A SEAT
YOU WISH TO SEE ME SIR?
PARDON ME MR SIMPKINS, BUT I UNDERSTAND YOU WILL SOON GRADUATE FROM THE ELITE SCHOOL OF BRICKLAYING. I AM THE MANAGER OF THE M^cSTEW CONSTRUCTION COMPANY, AND WE WOULD GREATLY APPRECIATE IT IF YOU WILL AGREE TO LAY BRICKS FOR US DURING THE SUMMER SEASON.
I CAN PROMISE YOU HAPPY AND CONGENIAL SURROUNDINGS AND OUR MOTOR WILL CALL EACH MORNING FOR YOU WE PAY $20.50 PER DAY, AND YOU MAY WEAR GLOVES! FURTHERMORE WE PROVIDE OUR BRICKLAYERS WITH AN ASSISTANT WHO WILL HAND YOU EACH BRICK AS IT IS NEEDED. THUS AVOIDING ANY STOOPING OR BENDING ON YOUR PART—
AND NOW FAREWELL MR SIMPKINS I TRUST YOU WILL CONSIDER MY OFFER. WE WILL APPRECIATE ANYTHING YOU CAN DO FOR US SIR
I'LL THINK IT OVER

If the labor situation keeps on as it is now, this may not be as far-fetched as it seems—From "Toronto Star"

W. C. Shultz, of Charles A. Shultz & Sons, manufacturers of brick and retailers of builders' supplies in New Jersey.

"Builders simply cannot see where they are coming out at present prices," he said. "I expect a distinct slowing up of business before the end of the year. High wages in the building trades has been complicated by bonuses paid the men by builders who are anxious to get their work done before they are overcome with additional advance in costs. Prices today are at the 1920 peak and are going higher. We recently advanced our men 15 to 20%, and the end is not yet."

Building Operations Stopping

Building operations in all parts of the United States are being halted, according to delegates to the recent convention of the National Association of Manufacturers.

A canvass of 50 manufacturers, mainly engaged in the production of construction materials or allied lines, brought the invariable report that not only were labor costs, particularly in unskilled labor, mounting steadily, but that the production per man was decreasing; labor turnover, it was added, is enormous, and it is impossible to satisfy the demand which the men have made.

Several manufacturers from Ohio, Indiana and Illinois reported that much of the unskilled labor employed worked an average of three or four days and then quit. So plentiful is work, they say, that applicants for jobs apply with lunches in their pockets, prepared to stay the day out if the work is not too heavy. If it is they get their time out at noon and try another plant that they believe offers less work for the same or higher wages.

Costs of labor and material in the Middle West, it is reported, are more than twice those of 1913, and between 35 and 40% higher than in 1921. Plasterers in Cincinnati halted one big building operation by asking $20 per day, and in Dayton a big contractor has ceased work on 75 houses because of demands of workers allied to the mounting cost of materials.

Labor Costs the Disturbing Factor

Manufacturers were agreed that the labor situation presents the most serious problem of the moment and threatens the continuation of the present prosperity. Building operations cannot continue at anything like their volume, they agreed, unless prices are stabilized and production per man is increased.

Matters in the New York district have been further aggravated by the labor situation. Labor knows that it is extremely lucky to get the present top wage and, naturally enough, desires to hold these gains by means of a long time agreement. Bricklayers in New York City, for instance, recently demanded a $12-a-day wage for a two-year period. The Mason Builders Association, who were faced with the demands, decided that it would be mortgaging the future too heavily to agree to such a proposal in view of the likelihood of declining living costs and a possible general decline in wages during the next two years. So they struck back. And today, as a result, 3,000 to 4,000 men are idle, from $150,000,000 to $200,000,000 in partially completed construction in New York is idle, waiting, as one contractor expressed it, "for the men to come to their senses."

Some of the contractors, representing about 20% of the uncompleted work, and faced with the necessity of taking tremendous losses every day the jobs stand idle, capitulated and signed the two-year agreement. If the strike continues, between 50,000 and 60,000 men will be thrown out of work, and the total amount of new construction which will be halted will be over $250,000,000.

And will the buyers' strike have any effect on costs?

The "American Contractor" reports a conversation between an old contractor and a young builder, possibly fictitious, but none the less true, covering this point.

"Prices can't go down until the shortage of labor is overcome," said the young builder.

"They can't, can't they?" retorted the speaker. "Perhaps they can't, but I think differently. A union scale is a lovely thing, but it cannot hold out long against an empty stomach. Just wait until the building boom flattens out and you'll see men only too anxious to lay bricks, spread plaster or do anything else for barely enough to make a living. You won't get the job. Oh, no, for you are tied up in a two-year agreement; but there's nothing to hinder an outsider coming in and taking work at any figure he can get.

The Contractor Who Will Be in Clover

"Suppose I want to build a house and have just $5,000 to spend. I go to some contractor who isn't tied up to an agreement with the local labor magnates and tell him what I want and what I can pay. He goes down to union headquarters, tells the men that he can go ahead if they will agree to work for about half scale, but if they stick for $10 or $12 a day there will be no work at all. If they are hungry, what will they say?

"Why, I've seen the time, right in this town, when bricklayers followed a load of bricks up the street so as to get the chance to lay them for $1.50 a day. Too little? Of course it was. Just as much too little as the present scale is too high."

"Will labor take a cut when the crash comes?" asked the younger man.

"Search me," answered the old fellow. "Probably not, at least in the open. But union men will work at less than union rates, the same as they did in the shopmen's strike. Not in their own cities, not at all. But if Boise, Idaho, shopmen would work as strikebreakers in Portland, Ore., shops, and Salt Lake City, Utah, men, good union men, would go to Denver and do the same thing, why won't Fall River bricklayers and Boston masons sort of swap jobs in the same way when the pinch comes.

"When is it coming? I don't know. Wish I did But one thing is sure. You fellows keep on granting increased wages, and the material men keep on hoisting prices away out of sight, and the crash will come much sooner than any of us think. In fact, I'm none too sure it hasn't started now."

The Canadian Ingersoll-Rand Co., Limited, Montreal, Que., have just issued a new descriptive bulletin covering their Cameron double suction, volute centrifugal pumps. The illustrations are numerous and clearly set forth the special features of these pumps, while the text contains much useful information on the mechanical details, tests, dimension table and part list. The book is known as No. 7350-C, and will be gladly forwarded to any interested reader on application.

Kiln Scum on Face Bricks

Caused by Soluble Salts in the Brick Mixture —Overcome by Chemical Treatment or Increased Drying Rate

By JOSEPH KEELE
Chief of Ceramic Division, Department of Mines Ottawa

Occasionally red brick is much disfigured by light patches on the surface. This bleaching or discoloration, referred to as dryer, or kiln scum, is usually caused by the presence of soluble sulphates in the brick mixture, introduced by the clay or shale, or in the water with which the batch is mixed. During the drying process these soluble salts are concentrated at the surface of the bricks, and later, in the heat of the kiln, react with the iron oxide contained in the brick body causing it to impart a buff colour to the brick instead of the usual red, or the salts may simply form a light coloured opaque film which masks the true colour of the brick.

A bad case of scumming of face brick at their plant caused much trouble and loss to Merkleys, Ltd., at Ottawa, during 1921. Late in the season samples of scummed brick were submitted to the Mines Branch with the request that the source of the trouble be located and, if possible, a means of preventing further scumming be prescribed.

This brick is made from a mixture of Utica-Lorraine shale and marine clay by the stiff mud process. A qualitative analysis of the unburned brick showed the presence of water-soluble sulphates of lime and magnesia in sufficient quantity to account for the scum on the burned ware.

Several samples of shale and clay were then tested for sulphates with the following results. The clays were found to be free from sulphates, but, in all cases, the shale contained such salts. The upper beds of shale, which are very much weathered and have been leached by surface waters, contained very little, as did the lowest unweathered shale, while the middle beds which were only partially weathered and from which the sulphate salts produced by the oxidation of pyrite had not been removed by surface water, contained a fairly large percentage.

Since these middle beds are necessarily the source of most of the shale used, it would therefore not be practicable to work on a brick mixture without introducing these trouble-causing sulphates.

The problem then was to determine the best and cheapest means of rendering the sulphate salts harmless.

Salts Rendered Insoluble

The water contained in the freshly made brick takes the soluble sulphates into solution, and as the drying process progresses the water flows by capillary action to the surface where it is evaporated, leaving its burden of soluble salts concentrated at the point where they are most harmful.

By the addition of barium carbonate to the brick mixture a reaction takes place between it and the sulphates of lime and magnesia, producing barium sulphate and carbonates of lime and magnesia, all of which are relatively insoluble and therefore not productive of scum.

On analysis, the brick mixture yielded .023 per cent. of sulphur trioxide. By calculation it was found that about three pounds of barium carbonate per 1,000 bricks would be required to completely render the soluble sulphates insoluble.

Test bricks were made up in which this proportion of barium carbonate was incorporated, and burned in the Ceramic Laboratory. They were free from scum. Folowing this, a trial run of 30,000 bricks containing the barium carbonate was made at the brick plant. These bricks, when burned, were likewise free from scum.

Subsequently, the company installed a machine at the plant to feed the barium carbonate at a uniform rate into the pug mill, and it has been reported that during the early months of 1922 there has been no further trouble from scum.

Other salts of barium might be used in place of the carbonate, but they would have to be under much closer chemical control, lest they themselves cause scum.

Drying Rate Increased

Another means by which the scum may be prevented is to greatly increase the rate of drying the green brick. If the drying progresses slowly the evaporation takes place at the surface of the brick and any soluble salts will be concentrated there. If, however, the drying is hastened beyond a certain rate, the surface of the brick quickly becomes dry, and the balance of the moisture in the body is evaporated from below the surface and thus the bulk of the soluble salts remain below the surface where they cannot produce any scumming.

This method has certain disadvantages. Some clays cannot withstand rapid drying without cracking. At best, surface checking is almost sure to develop. Then, also, in order to obtain rapid drying, alterations in the drying chambers would be necessary in some plants and additional fuel would be required where direct heat is used for drying.

What Manitoba Will Spend

The Amount of Money to be Spent on Highway Construction During the Remainder of the Present Season

By A. McGILLIVRAY
Highway Commissioner, Manitoba

For the remaining portion of our fiscal year which ends August 31st, the proposed programme of highway construction in Manitoba is not as large as those of the past few years. Flood conditions which prevailed during the recent months entail considerably large expenditures for repairs. Apart from these the following expenditures are contemplated for this year on Good Roads construction, from this date, viz: Provincial expenditure in co-operation with municipalities, approximately $560,000,00, of which the province pays approximately $275,000.00 and the municipalities approximately $285,000.00.

These works will consist of the completion of certain grading contracts remaining over from last season, the building of certain links in some if our main highways, and the gravelling of other stretches of these highways previously graded and in some cases having already received a coating of gravel.

During the past winter a considerable amount of gravel was hauled on to some of these roads where it was found more economical to handle the material on sleighs. This will be spread and worked into the roads during the present season. In all it is proposed to gravel about 235 miles of highways this season.

There will also be reconstructed a number of bridges. The building of no very large structures is contemplated. In this connection the largest will be a reinforced concrete structure, 250 feet in length, trestle and beam design, estimated to cost $25,000.00, on the Lord Selkirk Highway at Morris.

Negotiations are also pending with the Dominion Government in connection with the construction of certain projects under the Canada Highways Act, which will be put under way later in the season.

New Timber Standards

Revised Grades for Structural Timbers are Recommended by Committee on Lumber Standards

At its last meeting the Consulting Committee on Lumber Standards approved the following recommendation on structural timber grades which originated with a sub-committee of the Lumber Manufacturers StandardizationCommittee.

"The Committee recommends that all structural timbers be divided into two general divisions to be known as 'standard' and 'common'; the standard to include that timber commercially known as merchantable longleaf in Southern pine and selected common in Douglas fir; the 'common' to include those grades designated as square edge and sound and No. 1 common in Southern pine and No. 1 common in Douglas fir, and that the present specification of the regional associations be revised along the lines of the Forest Products Laboratory's recommendation so that the grades may be given a definite working stress."

The tabulation given below shows how recently compiled suggestions of the Southern pine and Douglas groups for the proposed "standard" grade compare with the defect limitations of the "select grade" of the Forest Products Laboratory. The defect limitations noted apply to all timbers in the grade. The stress allowed timbers meeting the defect requirements of the "standard" grade will depend upon whether the material is light or medium weight or dense.

Proposed "Standard" Grade for Structural Timber

	Forest Products Lab. Defect Spec. for "Select Grade"	Southern Pine Assn.* (Southern Pine)	West Coast Lumbermen's Assn. (Douglas Fir) Suggested Modifications to Forest Products Lab. "Select Grade."
	Exceptionally light material (1250 lbs. per sq. in.)		
	Medium weight material (1500 lbs. per sq. in.)	Sound timber (1400 lbs. per sq. in.)	
Rate of Growth.		6 to 25 rings per in. (1600 lbs. per sq. in.)	6 to 25 rings per in (1600 lbs. per sq. in.)
Summerwood.	Dense timber (1750 lbs. per sq. in.)	Dense timber (1800 lbs. per sq. in.)	Dense timber (1800 lbs. per sq. in.)
Size of Knots.	Narrow faces and edges of wide faces; not to exceed ¼ width of face-maximum knot 1½". Wide faces: increasing in size toward center of height to ¼ of width of the face-maximum knot 3".	On horizontal or narrow faces shall not exceed 1/3 width of narrow face for faces less than 12" and ¼ width for faces from 12" to 16" but may increase to 1/3 or 1/4 width of wide faces respectively towards center of height of wide or vertical faces. Note—Above refers to size of sound and tight knots.	Narrow faces: not to exceed ¼ width of face permitting a maximum knot of— 1½" in 6" face 2" in 10" face 2½" in 16" face 3" in 24" face Wide faces: 3" in 6" face 4" in 10" face 5" in 16" face 6" in 24" face
Angle of Grain	1 in 15	Not to exceed 1⅛" in 12" (1 in 10.7).	
Shake	¼ the width of the piece in green material 1/3 the width of the piece in seasoned material.	Not to exceed 1/3 width of green material or ⅜ width of seasoned material.	
Wane		Total width not to exceed 1/3 width of narrow faces for 1/3 length, but may be distributed on one or more edges.	

*The Southern Pine Association wishes to call attention to the following points in connection with the above matters relating to the proposed "Standard" grade.

1.—Common grade shall have the same limitations of defects as above and in addition may contain unsound or loose knots 1½ inches in diameter. The material however may be "sound", that is, without either rate of growth or summerwood requirements. Extreme fibre stress in bending shall be 1200 lbs. square inch.

2.—The standard grade with full "density requirements (33 1/3% summerwood and 6 or more rings per inch) shall be designated dense standard with a fibre stress of 1800 lbs. per square inch.

3.—A select structural grade carrying a fibre stress of [illegible] inch based upon the following rate of growth provision and defect limitations is contemplated.

Rate of Growth—6 rings per inch;

Summerwood—33 1/3 per cent or 50 per cent with less than 6 rings;

Size of Sound and Tight Knots—On horizontal or narrow faces shall not exceed ¼ width of narrow face for faces less than 12" and 1/6 width for faces from 12" to 16" but may increase to 1/4 or 1/6 width of wide faces respectively towards center of height of wide or vertical faces;

Angle of Grain—Not to exceed ¾" per foot (1 in 16);

Shake—Not to exceed 1/4 width of green material and 1/3 width of seasoned material.

Note—Wane, unsound or loose knots are prohibited in this grade.

Labor Saving Devices for Road Work*

Owing to the High Proportion of Labor Cost in Highway Construction and Maintenance Any Attempts to Reduce Costs Must Depend on the Use of Mechanical Equipment

The subject of mechanical labor-saving devices in road work not only interests the engineer in the construction of roads, but claims an attention much greater on the part of every engineer and road builder in their highway maintenance problems.

This paper will cover labor-saving devices used in Monroe County. The labor items in construction prove to be approximately 50 per cent. of the total cost, and in maintenance this item runs as high as 75 per cent. of the total cost. Cost for materials going into the work either in maintenance or construction, are practically a fixed figure. The first cost, including freight on materials, remains unchanged, no matter what efforts are put forth for a reduction. This is especially true in the small counties such as Monroe. With material charges fixed, it is easy to see that if the "Cost of Doing Work" is to be lowered, the decrease must come in the reduction of the labor items. A considerable reduction in labor costs can in many cases be made by the substitution of mechanical labor-saving devices, effecting a great saving in cost, giving a better and more satisfactory result, and making the work easier and more pleasant for the laboring man. Any such device, no matter how small or simple, that will replace labor in whole or in part should not only be used but great encouragement should be given all experimentation along this line. In Monroe County, with Detroit, Monroe and Toledo pulling heavily on the manpower in our section of the State, the problem is not altogether what shall we pay the men, but where shall we get them? This condition, among others, has led us to do considerable experimental work in developing devices to suit our purpose.

The Truck Dumping Chute

One of our first successful devices to save labor, worked out by a local trucking contractor, was a dump chute on the rear of our trucks for placing the slag in uniform piles at regular intervals along the side of the road. This attachment, I believe, was first used in Monroe County in 1919.

This detachable chute consists of a U-shaped trough inserted between the end of the dump body of the truck and the open tail-gate, the chute being made long enough so as to extend beyond the right rear wheel about twelve inches. On this twelve-inch extension there is a sliding gate which the operator opens in order to allow the material to pass. By trailing a string or wire of the required length behind the truck, piles can be placed at required distances. One man in addition to the truck driver is all that is required to unload the truck. The chute places the material the proper distance from the center of the road in neat, symmetrical piles, out on the shoulder far enough so as not to interfere with traffic, and, at the same time, keeps the material together, thus reducing the percentage of waste. We feel that at least two men have been saved by the use of this chute, and that the running time of the truck has been increased at least 20 per cent. Our average cost per square yard for unloading, hauling and placing slag in piles was slightly less than one-half of a cent per square yard. Last year we placed three of these chutes on our trucks at a total cost of $103.80, or approximately $35 a piece.

Chip Spreading Wagon

In the construction of macadam roads, one of the greatest calls on labor is in the spreading of the chips after the large stones have been keyed. This is usually done by spreading from the piles on the side of the road. In 1920 some experiments were made by converting a "New Idea" manure spreader into a chip spreader. Instead of having a travelling floor, the chips were conveyed to the rear of the spreader by means of a double chain belt upon which were fastened one and one-half inch angle irons. At the rear of the spreader was a specially-developed revolving drum with horizontal compartments. As the chips reached the end of the spreader, they dropped into the horizontal compartments of the revolving drum and from there were thrown out, spreading a strip about four feet wide. A hopper box was built on the spreader increasing the capacity one and one-half yards. The wheels were widened from six to twelve inches. This was done so as not to destroy the mechanical bond of the No. 1 stone. Steam rollers pulled the spreader.

The idea as represented in this machine is very good, and one that could be used economically if some loading device other than hand labor is available. The chips were spread evenly and the quantity so regulated that there was no chance for matting. The original cost of the machine was $125, and in remodelling about $300 more was used before the machine was in a serviceable condition. This machine, together with a mechanical-loading device, not only does the work better but replaces about four men in the operation.

The Concrete Pavement Breaker

Before taking up the cement-concrete pavement breaker, a word in regard to the demand for such a device will not be out of place. The Dixie Highway, running from the north limits of the City of Monroe to the Huron River, or north county line, was built in 1918. The construction of this road was rushed as a war measure to facilitate the transportation of war trucks from Detroit to the Atlantic seaboard. The road was built about one and one-half miles from the Lake Erie shore on a clay soil, which seems to have a great attraction for water. This is true especially under the pavement slab. The subgrade underlying this pavement is made up of a more or less plastic mixture of this fine silt and water. On this yielding subgrade the plain concrete slab gives way under the extreme heavy traffic which it is called upon to bear. Generally the breaks first occur on the edges and gradually creep into the center of the pavement. Approximately 5,000 square yards of patching was done on this 14-mile stretch last year. In order to assist in the breaking out of the patches on this road, a pavement breaker was built.

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*Presented by W. S. Cummings at the ninth annual Michigan conference on highway engineering.

This machine consists of an old two-ton "Republic" truck, with a six-horsepower gas engine and hoist mounted on it for the power unit, and a driving hammer device on the rear for the working unit. On the rear of the truck, about 20 inches from the rear axle, 13-foot leads were fastened to the chassis by means of an "A" frame built up on each channel of the truck frame. On the face of the 950-pound hammer is a 4-inch tool steel point. In moving the truck any distance the leads are dropped forward, the pivot-pin being at the top of the "A" frame.

Just back of the truck seat a square frame was placed, which is used as a rest for the leads when in a travelling position. It is also used to anchor the 2-inch by 4-inch supports to the leads when in a working position.

In operating this device, the hammer is only raised about three feet from the pavement and there allowed to drop. In no instance does the flat surface of the hammer hit the pavement. Just as soon as the point has pierced the pavement the truck moves to its new position.

One of the greatest expense items in the maintenance of the Dixie Highway north of Monroe was the breaking out of the patches by hand labor. With this breaker, as much work could be broken out in two hours as seven men could break out in two days. The machine, on an average, operates about two hours per day.

Central Mixing Plant

The central mixing plant was located about three miles north of Monroe, and consisted of a No. 27 E-Foote mixer placed on a ground level. A portable steel building with a capacity of two cars of cement was placed adjacent to it and the aggregate was hauled by trucks to this point from the cars on the railroad sidings at Monroe and from the quarry. The wet concrete was transported in Ford trucks with high-speed gears, and in no case, even on the longest haul of ten miles, did we have any evidence of initial set or any serious trouble in the segregating of materials in the bodies of the trucks.

The Blower

I am sure that we all agree that one of the essential conditions under which we get a good bituminous treatment on macadam roads is that the surface shall be perfectly clean. Very satisfactory results have been obtained by the use of a horse-drawn rotary sweeper and with the hand brooming of the surface, but with the idea of doing away with this class of labor and at the same time to improve the condition of the surface for the application of the bituminous material, we did considerable experimenting with the idea of blowing the surface clean. This was first tried out in cleaning small holes for bituminous patches. These patches were made either with the cold patch material or a hot mixture. We found that by using a small bellows we could free the hole from all the objectionable dust and fine chips. We then mounted a six-horsepower gas engine on an old two-ton truck, which was used to drive the fan of an insilage cutter also mounted on the chassis of this truck. By turning the fan at about nine hundred revolutions per minute, we were able to get a blast of air which was conducted to within 4 inches of the road surface through a 6-inch pipe. By this means, sufficient force was obtained to clean the road free from dust and chips. This air blast had its greatest effect upon a strip about two and one-half feet wide. By running the machine up and down the road, commencing at one edge and blowing over to the opposite side, we were able to get the surface of the road in an excellent condition for the application of the bituminous material. In doing this work, if there was any breeze the first trip of the machine was made on the windward side of the road, so that there would be no chance for the dust and chips to be blown back by the wind on the cleaned portion.

In preparing a road for its first treatment, especially if in a thickly-populated section, all people living on the road should be notified to keep all the windows and doors closed. A dust cloud of no small dimensions is formed by the blower and is quickly blown from the right-of-way. In order to assist in loosening any matter screenings on the road, wire brushes placed on a frame are lowered just in front of the rear truck wheels. Then, by making from two to four trips with the blower on each strip, the road is soon made ready for the treatment. In most instances, we found that the edges of old treated roads were very hard to clean. The earth from the shoulders and the sweepings from the road seem to form a more or less hardened mat at the edge of the metal. To assist in removing this mat, a triangular frame about 18 inches on each side was built with spikes extending through it. This frame was fastened to the side of the truck and there pulled through the matted matter along the edge, so as to engage the spikes in the mat. Then, with a small amount of loosening, a sharp blast of air would clean the edges very satisfactorily.

By comparing the cost of cleaning on roads where the surface was swept by the old method, we found a saving of two-tenths of a cent per square yard. Had the cost been the same, or slightly greater, the results obtained in treating a surface free from dust would have more than offset the additional cost.

Chip Spreading

Aside from our heavy trunk line maintenance on concrete and bituminous concrete roads, our greatest expenditure is made in the surface treatment of macadam roads. We have about 500,000 square yards of surface treated macadam roads to maintain. The method used last year in this work was to place 500-pound piles of slag equal distances apart along the side of the road, and, after the bituminous material had been applied, to spread the chips by hand. This did not prove entirely satisfactory, because of our labor shortage. Further, in order that all tar placed on the road shall be covered the same day, the distributor must be shut down about 3:30 each afternoon.

Both these conditions have led to experiments in our shop at Dundee with a mechanical chip spreader. When we succeed in securing a positive feed that will give us the quantity per square yard that we desire, our slag will be hauled to the road and placed in large 20-ton piles and there loaded into trucks by a small clam mounted on a truck. These loaded trucks, with the spreading device attached, will follow the distributor and will cover the road with chips about as quickly as the tar can be applied. We estimate that the spreading cost per square yard will be cut from 15 to 20 per cent., and all the labor required on the road will be two men on the distributor, two at the stock piles, one on the blower and the foreman.

Hints for the Contractor

Steam Shovel Clears Snow-bound Road

Snoqualmie Pass through the Cascade Mountains was clear of snow and open for traffic on May 15th, after only 18 days' work. An Erie shovel with a special 4 cu. yd. "snow dipper" started to clear the 6 miles of snow-packed road on April 24th and in spite of another foot of unexpected snow that was added by a late storm the work was completed in record time.

Six miles of road cleared of snow by means of a steam shovel

The opening of the Snoqualmie Pass is a big event in the State of Washington, as the Sunset Highway is snow-bound during the winter months at the summit of the Cascade Mountains. As soon as the pass is opened for traffic, the beautifully scenic Sunset Highway is at once made use of by hundreds of motorists from Eastern and Western Washington, bound on business and pleasure trips long delayed.

The special 4-yd. dipper

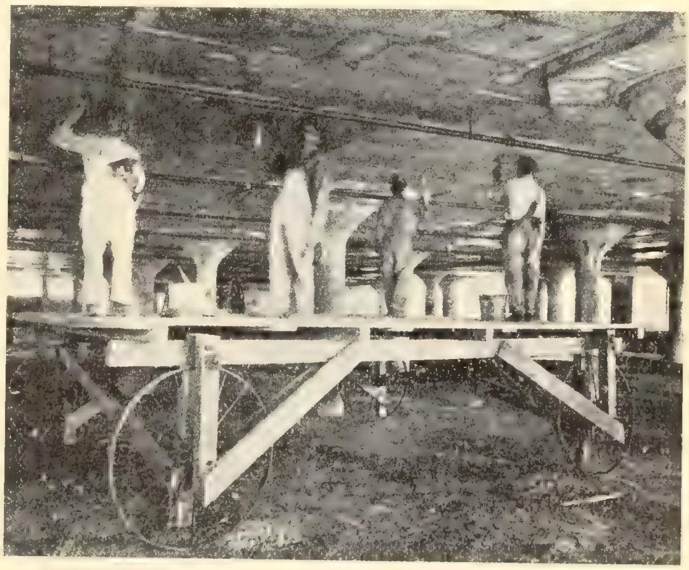
For the third successive year Rumsey & Jordan of Seattle have had the State Highway Department's contract for removing the snow from Snoqualmie Pass, from a point 4 miles west of the summit to 2 miles east of it. Besides being unusually deep this year, the snow was nearly as compact as ice, but the contractors were able to better their time of previous years because of the special "snow dipper," 4 yd. capacity on their Erie shovel.

Operation was also greatly speeded up by the use of caterpillar type mounting under the shovel, permitting it to move along without delay for laying planking, or swing around mats.

Movable Staging for Overhead Work

For work on ceilings, or other overhead work, the actual labor cost is usually increased appreciably through having to construct stagings or platforms from which to work, and also through the necessity for stopping work to move such platforms, particularly when only one or two men are using them, and help has to be called from other parts of the work to assist in the moving operation.

The Aberthaw Company of Boston has largely overcome this expense through the use of a movable staging. For overhead work it was formerly the practice to use large platforms. An ingenious foreman conceived the idea of placing wheels on one of these platforms and the result has been so satisfactory that the company has adopted the idea wherever overhead work is called for. The scheme is described in "Successful Methods" by G. W. Maker, of the Aberthaw Construction Co.



Inexpensive movable platforms make plastering work easier

The accompanying photograph shows one of these mounted platforms in operation. While mobility is its chief feature, it should be particularly noted that the arrangement is roughly though substantially constructed at small cost from material usually available on a construction contract. The frame is made of joists formerly used for form lumber, while floor form panels are used for the top. The wheels have been borrowed temporarily from concrete buggies and are supported on old form bolts driven through the platform posts.

These platforms, though crude, move with surprising ease—in fact, moving is accomplished by the workmen pushing on the ceiling with their hands and often the wheel has to be chocked to keep the platform steady. The economy of this arrangement, which permits workmen to operate continuously without frequent stops to move stages, is obvious.

As the Aberthaw Company always has a large number of construction jobs under way in different cities the total saving by the adoption of a device like that shown is a considerable item.

Building Trade in Jamaica

Considerable Activity is Evident in the Vicinity of Kingston—Large Importation of Construction Materials

Building in Jamaica came almost to a standstill during the period of inflation which lasted roughly from the middle of 1917 to the end of 1920, reports F. L. Casserly, of the office of the Canadian Trade Commissioner, Kingston, Jamaica, to the Department of Trade and Commerce. Prices during that time were abnormally high, and a cottage which could have been put up for a modest sum before the war cost a small fortune to build. The thickly populated areas of Jamaica, particularly Kingston and its environs, were faced with a shortage of dwellings, and rents soared to unprecedented levels. The slump, which hit the sugar planters and other agricultural producers so disastrously, has been a boon to prospective homemakers, the cost of building being only about 50 per cent. above the mean pre-war level. Thus there has been much building activity of late in Kingston and its suburbs, and many large properties are being sold and cut up into small lots. During the past six months there have been on an average 125 new buildings per month inspected by the municipal authority, in Kingston alone. No figures are available for the adjacent districts or for other parts of the island, but it is probable that this activity has been paralleled in the case of the former, where most of the better-off people who work in the city reside. Though many of the new buildings are shops, and still others are tiny cottages for the poor, quite a large proportion are middle-class houses, while a few are mansions. It should be noted that most of this construction is proceeding in a district with a population of only 85,000, the great majority of whom are compelled by poverty to endure a low standard of living; allowance must be made for this factor in any comparison with the building activity in northern areas of equal population. Thus there has been a marked increase in the demand for cement, lumber and almost every other type of building material, as well as for various household furnishings. The following notes on house construction will therefore be of interest to Canadian manufacturers:—

Type of Building

The one-floor cottage or bungalow with two, three or four bedrooms and plenty of verandah space, is the type of house most in demand. Two-storey houses are going out of fashion in Jamaica, and nowadays are built only by the well-to-do. The most popular form of construction is made up of concrete foundation; brick or concrete walls in wooden frame ("nog"); wooden roof, and sometimes metal shingles. Galvanized iron sheeting is used for shops and the houses of the poorer classes.

The homes of most poor people, and also of some few of the well-to-do classes, who cannot forget the 1907 earthquake, are built of wood throughout; but this form of construction, though earthquake-proof, is very hot in a tropical country, and the risk of fire is considerably greater than in the case of a brick or concrete building. Solid brick or concrete without any wooden frame is seldom met with to-day, on account of the high cost; the walls of such a house need to be at least as thick as when "nog" is employed.

Cement and Lumber

Canadian cement now sells at about the same price as English, and between them they cover most of the demand. The quantities of Danish, Dutch and German cement used are insignificant. Owing to energetic salesmanship, the Canadian product has risen to a position of prominence in this market which it did not possess eighteen months ago.

Supplies under this heading are entirely American, and come from the southern United States, pitch pine and white pine being the varieties used in housebuilding, the former for outside and the latter for inside work. Houses are invariably framed up in pitch pine, which, though fairly hard, is easily worked. These woods are unfortunately very vulnerable to attack by ants, which if left to themselves will do considerable damage in the course of a few years. A well-known British creosote preparation has been in use for some years as a prophylactic, and good results are claimed for it. Its effect, however, though very lasting, is not absolutely permanent; and it seems certain that if an insect-resisting timber could be placed on the market at competitive prices, it would in a short time completely supplant pitch and white pine. Jamaica has fairly extensive supplies of tropical hard woods which are impervious to ant attack, and specimens of which are to be seen in a perfect state of preservation in buildings over a century old; but owing to the absence of a local lumbering industry, the inaccessibility of the forests and the high cost of inland transport, the cost of such lumber is prohibitive. Hence it is very exceptional for native woods to be used in house-building, except in rural districts, where small supplies of Jamaican cedar are available. There are some who believe that British Columbia Douglas fir would stand insect-ravages better than pitch or white pine. If this could be demonstrated, and if some means could be found of getting such timber to Jamaica so as to sell at competitive prices, excellent business could be done.

Shingles and Trim

Cleft cypress shingles from the Southern States are the most popular; but shingles locally manufactured from native woods have a small though increasing demand, since they usually sell at a slightly lower figure than the imported article. At present, the local industry can take care of only a small fraction of the demand, but it is helped by the customs tariff, which imposes a duty of 4s. 6d. per 1,000 preferential, and 6s. general on imported shingles.

These are mostly imported ready-made in standard sizes from the southern United States, but a certain number are manufactured by local saw mills from American pine, and also from Jamaican woods. The same applies to mouldings, cornices, architraves and other kinds of interior trim.

Plasters and Paints

A cheap line plaster of local preparation is in almost universal use in Jamaica, and makes quite a good finish if properly mixed and laid on. All the ingredients are obtained in the island; hence, on account of its low cost, this form of plaster defies the competition of any imported article such as gypsum. After the plaster has been laid on and allowed to dry, walls are usually painted or distempered; inside walls, however, are sometimes papered.

Most of these supplies come from England, though of late American paints have been much in evidence. Ready-mixed paints are not much used. On account of their cheapness, distempers are popular. Varnishes are employed to a limited extent for interior work. A small demand has recently developed for floor paints; this gives promise of increase in view of the growing tendency of householders to abandon the traditional method of polishing floors on hands and knees with a cocoanut brush. Servants are becoming more and more averse to this laborious work, which really seems a waste of energy.

These supplies are mainly English and American; however, Canadian goods have lately been coming in, owing to energetic salesmanship.

Sanitary Fittings

Great Britain and the United States divide this trade, which has shown considerable expansion in recent years, with the growth of modern ideas on sanitation and comfort. It is only the houses of the very poor, situated beyond the range of Kingston's sewerage system, which still possess that ancient malodorous abomination the pitcloset. Water closets are in general use wherever the owners can afford them; not many of the houses noted at the beginning of this report are without this convenience. Also there is a growing demand for fixed lavatory basins with running water for bedrooms, to supplant the old-fashioned toilet set. Enamelled and galvanized sinks for kitchen and pantry are much in request; in all these articles the business is divided between Great Britain and the United States. The writer has never seen Canadian goods of this nature in any of the retail establishments in Kingston. Water closets cost, to the retail purchaser, from £7 to £15 each; lavatory basins from £4 upwards; galvanized sinks about £1 5s., and enamelled sinks about £4.

Kitchen Furnishings

Houses in this country are often delivered by the builder with kitchen stove installed. The most popular stove on the market is a well-known Scottish make which burns wood and is foolproof. A similar Canadian article, however, has lately been coming in. There is a growing demand for oil stoves, which give no smoke, are infinitely cleaner, and obviate the use of wood fuel which, besides being expensive, is a nuisance to most householders, owing to the chopping which has to be done. During the past year or so an American stove of this type has been introduced, and has done well despite its high cost; there are likewise a few makes of British oil-stoves on the market. Gas is available for cooking only in Kingston, but is very little used for this purpose.

Canadian Building Products Meet with Success in Foreign Countries

The A. B. Ormsby Company, Ltd., of Toronto, announce the receipt of a $40,000 order for their rolling steel doors, from Dansey & Company, Ltd., of Auckland, New Zealand, the doors to be used on a large contract which the latter firm holds with the Auckland Harbour Board. The Ormsby Company, in negotiating for this contract, submitted samples of the doors, accompanied by detail drawings for the inspection of the engineers, the doors being thoroughly tested in operation, following the usual procedure, before shipment. The doors made a very favourable impression with the Board's engineers, who were of the opinion that they were quite the finest doors imported into the country and they were unanimous in their choice of them for this large contract. The company also announce another big order under way from New Zealand, full details of which are not available at present.

The A. B. Ormsby Company's representative in New Zealand has been inspecting the markets for the company's products in that country and Australia and reports he is very much impressed with the possibilities of them. The two large orders referred to above should do much, too, to enhance the successful marketing of these products in Australia and New Zealand.

This is a field which this company had hitherto more or less neglected, but in the future they propose not only developing trade in the countries referred to, but to go into more fully the possibilities of export trade in general. Canadian manufacturers, almost in general, seem to be wary of the success of their products in foreign competition and these markets are not being cultivated nearly as much as they might. The success of the Ormsby Company should encourage other manufacturers to an investigation of the possibilities of placing their products in other countries.

Orton and Steinbrenner Co. Reorganize

The Orton & Steinbrenner Co., 608 South Dearborn St., Chicago, Ill., manufacturers of locomotive cranes, dipper shovels and grab buckets, announce a reorganization of the company and the election of the following officers: P. A. Orton, president and general manager; E. B. Ayers, vice-president; Herbert Mertz, secretary and sales manager; Harry Shaffer, treasurer and purchasing agent; G. L. Niederst, chief engineer and Alex Orton, works manager. No change in the management, control or policy has been made, nor is any contemplated. The reorganization is occasioned only by the resignation of Mr. H. G. Steinbrenner as president and the disposal of his interest in the company.

The Orton & Steinbrenner Co. was organized in 1906; its factory and works are located in Huntington, Ind., and main offices in Chicago, Ill., with representatives in all the principal cities of the United States and Canada. Beginning with the manufacture of a standard gauge steam locomotive crane, the company has gradually increased its line until at the present time it manufactures eighteen standard models of cranes and dipper shovels—gasoline, electric and steam operated; ten different types of grab buckets, and five styles of coal crushers.

How Does the New Sales Tax Affect You? Here is a Resume of the Changes Brought Down by the Minister on June 20

The new law respecting Sales Tax which will come into effect January 1st 1924 is contained in Bill No. 230 which was introduced in the Dominion Parliament on June 20. The Bill provides for a sales tax of 6% on sale price of all goods produced or manufactured in Canada, subject to certain exemptions; to be payable by the manufacturer at time of sale, and also provides for a similar tax on the duty paid value of all importations, to be paid by the importer.

Also on Canadian goods sold by a licensed wholesaler or jobber to other than a licensed manufacturer or producer, to be computed on the price paid for the goods by the licensed wholesaler or jobber.

It is provided that in certain instances the purchaser is to be furnished with a written invoice of the goods sold, which invoice shall state separately the amount of the sales tax. This provision applies to sales by licensed manufacturers and by licensed wholesalers to wholesalers or jobbers who are not licensed under the Act. The provision also applies in respect of goods sold by an unlicensed wholesaler or jobfer to a licensed manufacturer.

Exemptions From Sales Tax

Goods exported are to be exempt from the tax; also goods sold by a licensed manufacturer to another licensed manufacturer, or by a licensed wholesaler to a licensed manufacturer, to be used in, wrought into or attached to articles to be manufactured for sale and which are subject to the tax; also goods sold by a licensed manufacturer to a licensed wholesales or jobber; also goods sold by a licensed manufacturer or by a licensed wholesaler to a Provincial Government for the latter's own use; also goods sold by an unlicensed manufacturer, and good specified in the list of exemptions under the present law.

Materials for Re-Manufacture

After January 1st, licensed manufacturers will buy domestic materials for re-manufacture into other goods for sale, free from sales tax, provided the finished product is subject to sales tax when sold. If the person or firm from whom the raw material is purchased has paid a tax on such material, such firm will be entitled to a refund or deduction of the tax so paid.

A manufacturer importing raw materials to be re-manufactured into other goods for sale will be required to pay a tax of 6% on the duty paid value at the time of importation, subject to a refund of the sales tax paid on the imported raw materials when the finished product is sold, provided the finished product is subject to sales tax when sold.

A manufacturer who manufacturers goods which are exempt from sales tax will not be entitled to purchase raw materials to be used in the manufacture of such products free from tax, and on imported raw material he will not be entitled to a refund of the tax paid on importation. Likewise a manufacturer who does not receive a license, by reason of the fact that he does not manufacture or produce goods to be value of $10,000 or more during any fiscal year, will not be entitled to purchase raw materials free from tax nor to obtain a refund of the tax paid by him on imported raw materials. Such a manufacturer, however, does not have to account for sales tax on his sales.

Refunds

The first part of sub-section 8 provides for a refund to be granted to licensed manufacturers if the tax paid by them on imported materials when used in the production of a finished article is not exempt from tax.

Sub-section 8 provides that where a licensed manufacturer or a wholesaler or other dealer sells goods, on which tax has been paid, to a licensed manufacturer for re-manufacture into articles for sale, and provided the finished article is subject to the sales tax when sold, a refund of the tax paid will be granted to the vendor, manufacturer, wholesaler or dealer.

Sub-section 8 provides for a refund of the tax paid on all goods which a licensed manufacturer or a licensed wholesaler has on hand on January 1st, 1924, where such goods have been, are being, or are to be used in, wrought into or attached to articles to be manufactured or produced for sale, provided that the finished articles when sold are subject to sales tax. All refund claims under this proviso must be presented on or before June 30th, 1924.

Sub-section 9 provides for a refund or reduction, not to exceed 25% of the sales tax, in respect of goods manufactured and sold in Canada when similar goods may be imported free of customs duty.

Sub-section 10 provides for a refund of sales tax on the re-exportation of imported goods on which customs duties have been refunded. This section also provides for a refund of tax on domestic goods which are exported.

Provision is also made in the Bill for a refund to a manufacturer, producer, wholesaler, jobber or other dealer of tax paid on goods sold to a Provincial Government for the latter's own use.

The provision in last year's sales tax law for drawback of 99% of sales tax paid on materials used, wrought into or attached to articles exported, remains in force.

Under the provisions of Sub-section 11, where a manufacturer made contracts of sale before May 12th, 1923 on the basis of the present sales tax, and goods are delivered in respect of the contract after January 1st, 1924, the Government will allow a deduction equal to the difference between the 6% rate and the rate in force when the contract was made. But no deduction will be granted in respect of deliveries made under such a contract after March 31st, 1924. All claims for such deductions are to be filed on or before June 30th, 1924.

Rentals, Royalties, Custom Work Etc.

It is proposed to apply the 6% tax to goods which are leased without being sold; to goods on which a royalty is payable; to goods manufactured by contract for labor only, and apparently, also, to goods which are manufactured for the manufacturer's own use and which are not to be sold.

The Week's Developments in a Nutshell

The outstanding event of the week has been the decided turnover in government in the Province of Ontario. The farmer government has been replaced by the old time Conservative party with amply majority over all opposition to carry on without any fear of embarrassment. Perhaps the two main points at issue were the Highway and the Hydro policies. The latter has been definitely settled by the re-election of Sir Adam Beck by a large majority; he will doubtless retain the chairmanship of the Hydro Commission. The Highway policy of the new government is apparently defined in a brief statement by premier-elect Ferguson to the effect that the plans of the former government will be carried out practically as outlined.

Another important item is the final discussion on the new sales tax. The Minister has brought in his amendments, and we suggest that our readers study these immediately to see whether there are any "hidden rocks" that can be removed before it is too late.

There is a distinct rumble of discontent in the labor market but no certainty of wide spread trouble as yet. In Ottawa the street railway employees are fighting for improved conditions and higher wages. In Sydney the coalminers are on strike with threats from the steel workers. Across the line bricklayers are on strike in New York for $25.00 a day and plasterers recently struck for $27.00. The threats of the coalminers in Pennsylvania district will tend to throw central Canada into a panic owing to the fact that no steps have been taken by those in authority to insure a supply of coal for the coming winter. All of which would seem to indicate that the worst thing that could happen to the country is a boom in business. It is foolishness to try and carry out the construction work of two or three years in a single year; it simply means bidding for labor that does not exist.

The steel companies continue very active. The Steel Company of Canada is working at capacity with orders on hand to the end of the year. This company's operations form a splendid barometer of industrial conditions generally on account of their diversified products.

A circumstance that indicates the attitude of the public mind perhaps better than anything else is the drop in stock market securities. Evidently the public is in an exceedingly cautious, almost nervous, condition. There have been so many warnings against booms that the slightest recession in the price of a stock seems to be taken as a panic signal. While this may be disconcerting at the moment it is probably a very healthy condition. At a time like the present over-confidence would be fatal. A policy of Safety First will give much better results.

The lesson that seems to be taught by the recent past then is that we should not attempt to rush matters unduly. Every move in that direction further complicates the labor and material market, particularly labor. If the men insist on continuing their exhorbitant demands the inevitable result of course will be a holiday. It is probable, however, that a brief one would satisfy them.

Mainly Constructional

East and West—From Coast to Coast

The erection of a highway bridge immediately below and beside the existing Victoria bridge between Montreal and the south shore of the St. Lawrence river is recommended by the Montreal Board of Harbor Commissioners in a report to the Dominion Government. The estimated cost of erecting the bridge is given at $3,000,000. The erection of such a bridge, the commissioners state, would relieve acute traffic congestion for some time to come. The report further states that the commission, having as its first consideration the interests of Montreal harbor, excluded from consideration any suggestion for bridging the ship channel below St. Helen's Island, and likewise any suggestion of a tunnel. Both these projects, it is stated, would be prohibitive in cost.

The estimated cost of elevating railway lines at level crossings in the city of London and the erection of a new Union Depot, made by Mr. C. G. Bowker, General Manager of the Central Region of the C.N.R., is $8,400,000. At the city's request, a conference was held between the members of the city council and the railway authorities to revive the 17-year old proposals for these improvements, but the city council were rather shocked when Mr. Bowker submitted the above estimate of the cost. Seventeen years ago, when the matter was first proposed, it was estimated that this work would cost $4,500,000.

The Montmorency River bridge, on the St. Anne Highway, Quebec, has been declared unsafe for the heavy traffic it has to carry. The bridge is located only a few hundred yards from Montmorency Falls, one of the most picturesque spots of Canada, and it carries a heavy tourist traffic during the summer months travelling to and from the famous St. Anne de Beaupre shrine. The present bridge has been considered dangerous for some time, and though the municipalities had discussed the matter on several occasions they did not take any action. The great danger has prompted the Government to investigate. Should the municipalities not aid, the Government will request the Public Service Commission to distribute equitably the financial responsibility for work done, and the repairs will be started immediately. In this connection also, Mr. Ivan Vallee, chief engineer of the Department of Public Works, is leaving next week for Niagara Falls and other American points to view types of bridges which would be most suitable for the historic spot. The bridge is still considered safe for light traffic, and the danger not immediate, but engineers are watching to see that no heavy load is allowed to cross the river.

Messrs. Harries & Hall, well known firm of landscape architects at Toronto, have been employed by the Civic Hospital Board, at Ottawa, to plan for the improvement and beautification of the grounds of the Civic Hospital there. A considerable sum of money was provided for this purpose by the late Ex-Ald. Black, of that city.

The Taylor-Lackey Company at Ottawa were successful in securing the tender for the completion of the new Nurses' Home there, the figure being $400,661. Tender for the elevators was let to the Otis-Fensom Company, at $61,205. Tenders for the refrigerators in the Service Building and in the Main Building were let to the Ross-Meagher Co. and A. I. Garvock, respectively, at figures of $16,000 and $16,800.

Mr. J. J. Macnab, civil engineer and contractor of Trenton, Ont., is erecting a plant for the manufacture of concrete products, including concrete blocks, bricks, farm tile, culvert tile, etc. The plant is not entirely completed as yet, but manufacturing operations are already under way.

The Sinclair Construction Co. Ltd., of Toronto, was the successful tenderer for the construction of the branch line from Swastika to the Crown Reserve Mine at Larder Lake, Ont. Construction is to be started at once, and it is expected that a force of about 1,000 men will be employed as the steel is to be completely laid before the end of the year.

City council at Toronto, recently passed a by-law to authorize the raising of $4,000,000 to provide funds for the transportation commission on account of the purchase of the Toronto Railway and to provide plant and equipment.

Personal

Mr. F. L. Dougherty, builder of Sandwich, Ont., has been appointed building inspector of the town.

Messrs. Norman D. Wilson and Arthur E. K. Bunnell, engineers of the city of Toronto, have formed a partnership under the firm name of Wilson & Bunnell, with offices in the Hamilton Trust Building, at 57 Queen St. W. Both members of the firm have had many years experience in railway and general municipal engineering and surveying. Mr. Bunnell is managing engineer of the Toronto Civic Guild.

Hon. Dr. W. H. Sutherland, Minister of Public Works of the province of British Columbia, recently completed a three-weeks tour of the province, inspecting roads. Speaking of conditions generally as he found them, Dr. Sutherland said, "Crops are good, mining operations are opening up all over the interior to a greater extent than ever before, and the lumbering industry is also away to a good start for the season. Taking it all in all British Columbia is facing one of the most prosperous years in its history."

Mr. George Wood, of Windsor, Ont., a well known contractor and builder, has recently been appointed building inspector for that city, in succession to Mr. R. Parker.

Horace L. Seymour, C.E. (Tor.) with offices in Toronto and Weston, Ont., has been appointed engineer to the Weston Water, Power and Light Commission. He is also engaged in general municipal engineering work for the town, and is acting as resident engineer for the town on the sewerage system to be installed in unsewered districts of Weston, for which work Mr. W. B. Redfern of James, Proctor & Redfern is the consulting engineer. Mr. Seymour has just recently been transferred from an associate to full member of the Engineering Institute of Canada.

Obituary

Mr. W. H. Randall, manager of the Toronto branch of the Neptune Meter Company of New York, died at his residence in Toronto recently after an illness of one month. Deceased was born at Aldershot, England, 57 years ago and came to Toronto at an early age. He was connected with the Water Works Department at Toronto for 32 years, the latter years as superintendent. He had been connected with the Neptune Meter Company for the past four years. Mr. Randall was a member of the American Water Works Association.

Trade Incorporations

Messrs. Couture & Frere, manufacturers of cement blocks, were recently registered at Montreal.

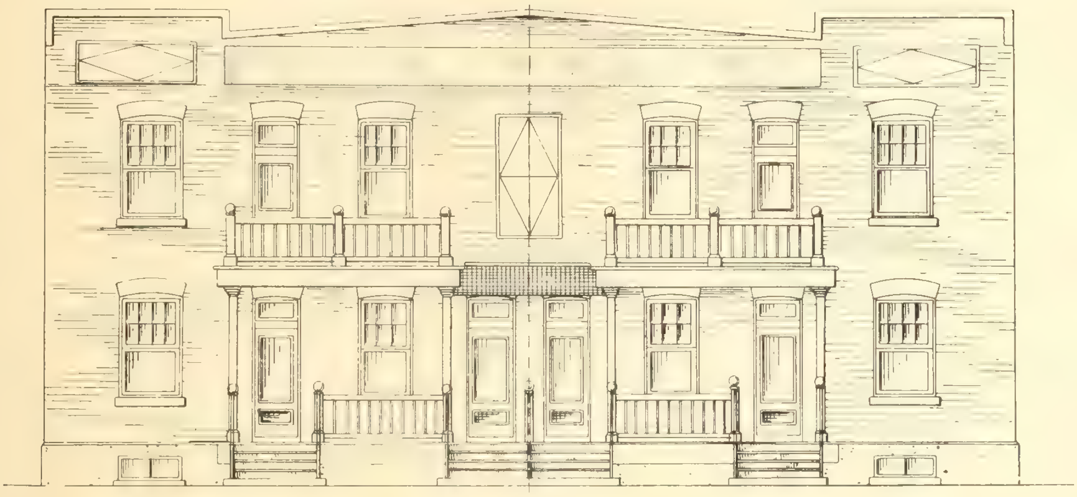
Canada Limestone Co. Ltd., with head office at Quebec, P.Q., capital $20,000, to carry on a quarrying business and to deal in limestone, granite, marble, etc.

Lac Ouareau Flour Mills Stone Ltd., with head office at St. Liguori, P.Q., capital $49,000, to carry on the business of general contractors and builders.

Verdun Dwelling Construction Co. Ltd., with head office at Verdun, P.Q., capital $20,000, to carry on a building business.

The Contract Record's

Weekly House Suggestion No. 74

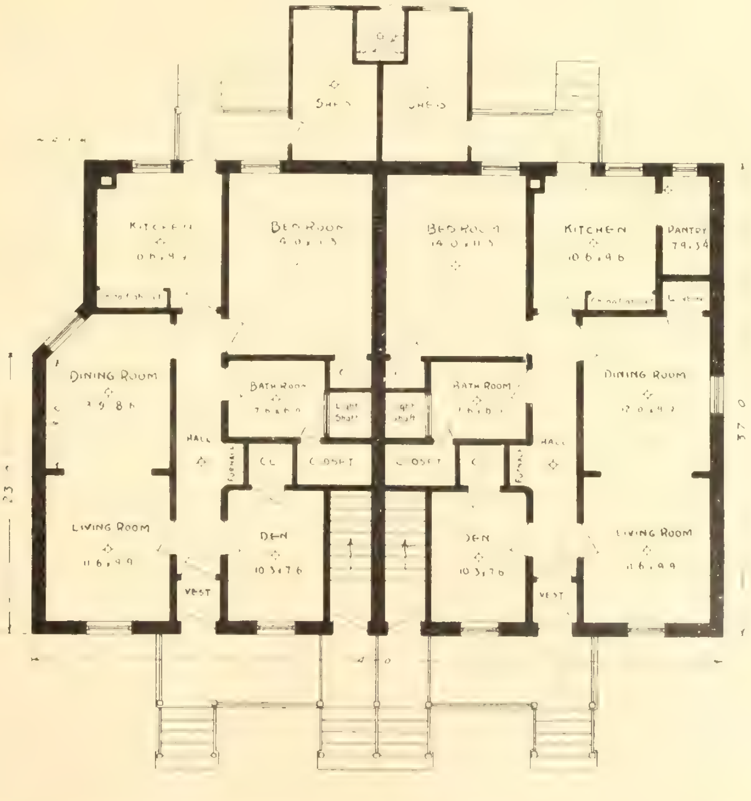


The house illustrated herewith is one of a number built at Notre Dame de Grace, Montreal, and was designed by Messrs. Bastien & Cartier, architects of that city.

Economy is the outstanding feature of this house, which is one of the semi-detached type, the entire cost being $8,500. It contains four complete residences, each of five-well ventilated rooms. The light required for the bathrooms of the four residences is supplied through shafts disposed on both sides of the dividing wall.

Each residence has its separate entrance and the rooms are conveniently laid out with relation to each other. The plan includes ample closet space and a fair-sized pantry off the kitchen.

The front is of rustic brick and the side and rear walls of solid plastic brick. The lower residences have front and rear verandahs, as seen in the illustration, and the upper floors have balconies at the front and rear.



CONSTRUCTIONAL ACTIVITY

Period of June 27 to July 3, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Goderich, Ont.

Huron county council proposes to grade, widen and resurface roads throughout the county at a cost of about $125,000. In addition to this sum the council proposes to purchase and repair road machinery to the extent of $7,500.

Haileybury, Ont.

Town council contemplates the erection of a pumping station and the purchase of fire fighting equipment. Debentures amounting to $20,000 will be sold to provide the funds for this work.

Montreal, Que.

Tenders for a force main will be received by the city council until July 10. Plans and specifications are with Montreal Water Board, 19 Atwater Ave.

The city has prepared specifications for a tunnel to contain watermains to be built under the Lachine canal, at Atwater Ave. Rene Bauset, city clerk, will call for tenders in about three weeks.

Oshawa, Ont.

The following roads and sidewalks are contemplated by the town council; asphalt pavement—Simcoe St. from Duke St. to Metcalf St. and King St. from Mechanic St. to Prospect St.; asphaltic concrete pavement—Division, Bruce, Hillcroft, Masson, Gretna, Celina, Aberdeen, Connaught, Arthur, Harold Sts. and Barrie Ave., Olive Ave. and Ritson Rd., concrete sidewalks—Alma, Caradoc, Athol, Oshawa, McGregor, St. Lawrence, Jarvis, Base line east and Eulalie Ave.

Owen Sound, Ont.

The city contemplates laying sewers on the following streets at a cost of $18,834: 13th St. east, 4th Ave, east 1st Ave east and 2nd Ave. east. C. Gordon, city clerk.

St. Thomas, Ont.

The city council contemplates paving Gladstone Ave., south from Metcalfe St. to Southwick St., with asphalt at a cost of $31,888. Concrete curbs and gutters will be laid on both sides of the road. W. B. Doherty, city clerk.

Sandwich, Ont.

Concrete sidewalks for the following streets are contemplated by the town council: Bloomfield Road, west side, South St. to Prince Road; Alexander Ave., both sides; Felix Ave., both sides; Baby St., west side, south from Chippewa St.; Perry St., west side; Partingdon Ave. Tenders will be called shortly. E. R. Worth, town clerk.

The town council may lay sewers on the following streets: Perry St.; Baby St., Chippewa to South St.; Alexander Ave.; Bloomfield Road from South St. to Prince Road. Tenders are expected to be called shortly.

Saskatoon, Sask.

The city will require the following materials for waterworks extensions: 850 lineal feet of 8 in. cast iron waterpipe; 3,100 lineal feet of 6 in. cast iron waterpipe; necessary valves, fittings, etc., and approximately 1,350 lineal feet of 10 in. sewer pipe, 2,500 lineal feet of 8 in. sewer pipe and materials necessary for manholes, etc. A. Leslie, City Hall, Commissioner of Works.

Stratford, Ont.

The city is having specifications prepared for the enlarging of sewers on Lae, Victoria and River Aves. W. H. Dorland, clerk.

Toronto, Ont.

Tenders for laying and jointing waterpipes on Rosedale Heights Drive, will be received by the city council until July 10. Specifications are at Room 320, City Hall.

York township council contemplates having six inch cast iron watermains laid on the following streets: Montcalm and Gilbert Sts., $7,700; Russell Hill, Warren and Tarlron Rds., Collegeview Ave. and Chaplin Cres., $18,000 and Westbrooke Ave., $2,250. W. A. Clarke, 40 Jarvis St., Toronto, township clerk.

CONTRACTS AWARDED

Burlington, Ont.

The town council has awarded McArthur Engineering & Constructing Co. Douglas St., Guelph, the general contract for paving Burlington Ave. from Ontario St. to Brick St.

Duncan, B. C.

Donald Cameron, 864 Hamilton St., North Vancouver, has the general contract for a waterworks system for the town costing $45,000. The work consists of about two and a half miles of excavation and the laying of pipe.

Hamilton, Ont.

The city has awarded the following contracts for sewers: Paisley Ave. $7,600, Barclay Ave. $4,750 and Newton St. $7,600, Webster Construction Co., Bank of Toronto Bldg., London; Vansitmart Ave. $9,000, Tragina Ave. from Britannia to Main St. $12,367, J. D. Armstrong, 871 Main St. east, Hamilton.

Lachine, Que.

Leger & Charlton, Lachine, have the general contract for a bituminous pavement for the town at approximately $18,990.

Lethbridge, Alta.

Sewer extensions costing $8,800 will be made by the Commissioner of Works.

Listowel, Ont.

F. W. Johnston & A. Clements, Listowel, have the general contract for drains for Minto township. W. D. McLellan, Harriston, township clerk.

Point Grey, B. C.

W. Leadingham, Municipal Hall, point Grey, has the general contract for concrete sidewalks for the town at a cost of $4,599. The walks will be a quarter of a mile long and five feet wide.

Princeton, Ont.

R. Robertson, Princeton, has the general contract for a drain for Buford township. Work will be completed by October 1. Lee & Nash, Temple Bldg., Brantford, engineers.

Regina, Sask.

The Provincial Department of Highways has awarded L. J. McFadyen, Wapella, the general contract for roadwork between Broadview and Oakshella, a distance of nine miles, at an approximate cost of $12,000.

The following road contracts have also been awarded my the Saskatchewan Department of Highways: from Radville south, R. Eidsness, Radville; Battleford south, C. B. Morgan, Tisdale; Maidstone, east 4 miles, Hugh Hill, Lloydminster; East End to Southfork, F. A. Mamoser, Shaunavon; Melfort, west 14 miles. Brandt & Fenske, Nokomis.

St. Catharines, Ont.

Subject to the passing of a by-law, J. C. McNamara, 17 Duke St., has been awarded the general contract for 10,000 lineal feet on concrete sidewalks and 1,500 lineal feet of combined curbs. B. F. Lamson, city engineer.

Toronto, Ont.

The city has awarded the following contracts for laying watermains: Grant Contracting Co., 50 Frant St., east $3,569 and W. E. Taylor, 22 Falcon St., $6,132 .

Additional contracts awarded by the Provincial Department of Highways are as follows: 915 concrete pavement, 1.75 miles. L. Pettypiece, Amherstburg; 1000 concrete pavement, Burlington Beach, 4.4 miles, Grant Construction Co., Burlington; 1009 asphaltic concrete pavement, Whitby to Oshawa, Johnson Bros. Brantford; 1004 macadam base course, Crofton school house south to Bloomfield, 3.2 miles, including grading, C. Bryson, Brockville; 1008 grading, Main St., via filter beds to Hamilton city line, 4.1 miles, Nicholson & Bohan, West Monkton; 1007 bridge abutments, Dodd's Creek Bridge, Lambeth, James Vance, Woodstock; 1010 bridge abutments, Cayuga bridge, Canadian Engineering and Contracting Co., Hamilton.

Victoria, B. C.

The Provincial Government has awarded DeWolf & Ham, Cranbrook, B. C., the general contract for three and a half miles of road from Kitchener to Goat River Crossing, at $35,000.

The Provincial Government and the Municipality of Saanich will pave two miles of the West Road from Observatory Hill to beyond Sluggets at a cost of $25,000.

Railroads, Bridges and Wharves

Fredericton, N. B.
Tenders for the construction of "Gulliver" bridge, Northumberland county alternative designs, will be received by the Provincial Government, Department of Public Works, until July 18. Plans and specifications are at the department.

The Provincial Government will also receive tenders for the construction of "Semiwagan" bridge, Northumberland county, until July 18. Alternative designs will be considered. P. J. Veniot, Minister of Public Works.

Goderich, Ont.
Huron county council contemplates spending $32,000 on bridges and culverts this year. T. R. Patterson, Goderich, engineer.

Islington, Ont.
Tenders for the construction of a reinforced concrete bridge for the Etobicoke township council will be received by Stephen Barratt, township clerk, until July 7. James, Proctor & Redfern, Toronto, consulting engineers.

Perce, Que.
Tenders will be called shortly by the town council for the construction of a metallic and concrete bridge, 90 ft. long and 25 ft. high. I. E. Vallee, Department of Public Works, Quebec, engineer.

Regina, Sask.
The city plans an extension to the street railway on 17th Ave. east, Victoria Ave. and Lindsay St. Steel and ballast have not yet been purchased.

St. Remi d'Amherst, Que.
The Provincial Department of Public Works contemplates the construction of a bridge. Materials will be furnished by the town council. P. Turcotte, town clerk.

CONTRACTS AWARDED

Chateau Richer, Que.
Napoleon & Cesaire Taillon, Chateau Richer, have the general contract for a steel bridge for the town council costing $6,600.

Toronto, Ont.
The general contract for the construction of a subway on Danforth Ave. has been awarded by the Provincial Government to the Provincial Contracting Co., 10 Adelaide St. East, at an approximate cost of $100,000.

The general contract for the construction of a steel bridge with concrete abutments across the Humber River has been awarded to Johnston Bros., Brantford, by the Provincial Highways Department, at $292,000.

Public Buildings, Churches and Schools

Ford, Ont.
Nichols & Sheppard, 15 Sandwich St. West, architects, will prepare plans for a school for the Public School Board. The building is estimated to cost $210,000.

Gore Bay, Ont.
Smith & Wright, 2945 Dundas St. West, Toronto, have prepared plans for a school for the Gore Bay Public School Board. The building will be two storeys high, concrete block and stucco construction costing $40,000. Tenders will be called shortly.

Goderich, Ont.
The School Board will have plans prepared for the remodelling of the collegiate. It is estimated that the work will cost about $40,000. J. E. Ford, chairman of the board.

Gull Lake, Sask.
Tenders will be received by the town clerk, O. W. Howard, until July 9 for the construction of a fire hall and municipal building for the town as follows: 1. supplying all material; 2. construction only; 3. materials and construction; 4. concrete work to floor level; 5. for completion from the floor. Plans and specifications are at the clerk's office.

Haileybury, Ont.
Town council will submit a by-law to the ratepayers authorizing the construction of a fire hall at a cost of $15,000. Herbert A. Day, town clerk.

Hamilton, Ont.
The School Board will receive tenders for the installation of new pumping and drainage in Fairfield school. J. H. Foster, secretary of the board.

Kitchener, Ont.
Tenders for the construction of the Sisters of St. Joseph Hospital, Queen st. near Crescent, will be received until July 9 by Watt & Blackwell, Bank of Toronto Bldg., London. The structure is estimated to cost $440,000.

Kirkland Lake, Ont.
Tenders for the erection of a two storey school, frame and Bishopric construction, will be received by F. Clarke, secretary of the School Board, until July 14. The building is estimated to cost $40,000.

Mitchell, Ont.
Tenders for the construction of a two storey brick high school containing six rooms and an auditorium, will be received by A. D. Cameron, secretary of the School Board, until July 14. Plans and specifications for the building, which will cost about $50,000, are with the secretary and H. C. McBride, architect, Molson's Bank Bldg., London.

Moncton, N.B.
R. A. Frechette, 30 Bonaccord st., has prepared plans for an $125,000 hospital for the Roman Catholic Diocese and will supervise the construction.

Montreal, Que.
The Italian Association, c/o J. E. Patrick, architect, 4th. ave., Rosemount, contemplates a college costing $200,000 to be built in the vicinity of Mile End Station.

Paris, Ont.
Shultz Bros. & Co. Ltd., 35 Albion St., general contractors, will let steel and electrical contracts for Paris High school.

Quebec, Que.
Tanguay & Chenevert, 20 D'Aiguillon St., are preparing plans for a three storey school, 60 ft. x 100 ft., concrete block foundation, brick and structural steel construction, for the School Board. Antoine Taschereau, Parliament Buildings, secretary.

Toronto, Ont.
Contracts for roofing, heating, plastering, electric wiring and plumbing for Danforth Methodist Church will be let by G. M. Miller & Co., architects, 93 Yonge St.

Separate tenders for masonry, carpentry, heating, plastering, wiring and plumbing, for a Parish Hall estimated to cost $10,000 will be received by Chas. Rigby, 234 Milverton Blvd. indefinitely. The building will be of brick, 37 ft. x 27 ft.

CONTRACTS AWARDED

Hornpayne, Ont.
George Duncan, Sudbury, has the general contract for a brick school costing $32,000 for Hornpayne School District. R. E. Mason, 13 Victoria Block, Fort William, architect.

London, Ont.
Askin Methodist Church has awarded R. G. Wilson & Son, 398 Talbot St., the general contract for a brick gymnasium, 45 ft. x 80 ft., costing $15,000.

Montreal, Que.
A. D. Boileau, 245 McDougall St., has the contract for furnishing cutting and laying of all stone and brick and backing of all interior walls for the City Hall,

South Porcupine, Ont.
The Public School Board of Tisdale township has awarded F. Trudell, Timmins, the contract for labor for a $65,000 school. A Lecuyer, Timmins, has the plumbing contract.

The contract for steel for St. Hermigilde Church has been awarded to Dominion Bridge Co. Ltd., Lachine; roofing, plumbing and heating contracts have been awarded to M. Chouinard, 751 Adam St.

Paris, Ont.
Shultz Bros. & Co. Ltd., 35 Albion St., general contractors, have awarded the following contracts for the erection of Paris High School, estimated to cost $80,000; Plumbing and heating, Cunningham & Co., Grand River, Paris; brick, Cooksville Brick Works, Cooksville.

Sherbrooke, Que.
Newton Dakin Construction Co. Ltd., 181 King St. W., are general contractors for a fire station for the town estimated to cost $52,400. The building will be three storeys high, 60 ft. x 80 ft., stone and brick construction.

Strathroy, Ont.
The Hospital Board has awarded Cook & Kilpatrick, 116 Davis St., Sarnia, the plumbing and heating contract for the $20,000 nurses' home. Concrete blocks will be supplied by R. Pincombe, Strathroy.

Toronto, Ont.
City of Toronto has awarded the following contracts for the erection of stables and cart sheds on Keele St.: Masonry, J. W. Hewitt, 56 Roncesvalles Ave., $19,950; carpentry, F. Markham, 156 Alexander Blvd., $11,500; roofing, W. G. Edgate Ltd., 45 Richmond St. E., electrical, Harris & Marson, 81a Park-

(Continued on page 58)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders Wanted

For the construction of municipal drain in the Township of West Luther, known as drain No. [illegible] Marked cheque of ten per cent of amount [illegible] must accompany all tenders.

Lowest or any tender not necessarily accepted. Plans and profiles may be seen at the clerk's office.

Tenders to be opened at the Township Hall, Damascus, Saturday July 7th, at 2 p.m.

W. W. DUNCAN,
27 Comm. Township Clerk.

COUNTY OF LINCOLN

Tenders For Concrete Pavement

Sealed tenders, marked "Tender for Pavement," and addressed to Camby Wismer, County Clerk, St. Catharines, will be received until 6 o'clock P.M.

Wednesday, July 11, 1923,

for the construction of approximately 14,000 square yards of Concrete Pavement in the Village of Port Dalhousie.

Information pertaining to the work may be obtained from the County Engineer.

No tender necessarily accepted.

F. N. RUTHERFORD,
County Engineer,
27 St. Catharines.

Sealed Tenders addressed to the undersigned, and endorsed "Tender for repairs to breakwater at Toronto Island, Ont.", will be received at this office until **12 o'clock noon,** (daylight saving.)

Thursday, July 12th, 1923,

for repairs to the breakwater adjacent to the southern shore of Toronto Island, County of York, Ont.

Plans and forms of contract can be seen and specification and forms of tender obtained at this Department and at the office of the District Engineer, Equity Building, Toronto, Ont.

Tenders will not be considered unless made on printed forms supplied by the Department and in accordance with the conditions contained therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p.c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

Note.—Blue prints can be obtained at this Department by depositing an accepted bank cheque for the sum of $20.00, payable to the order of the Minister of Public Works, which will be returned if the intending bidder submit a regular bid.

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, June 19, 1923. 26-27

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 14, Section N, subsection (c)" will be received by the undersigned until eleven a.m. standard time on

Wednesday, July 18, 1923,

for the excavation of approximately 27,000 cubic yards of earth and other work required in the construction of Provincial highway from Wolfe north—6 miles.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:—

Wm. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.; E. R. Dunnett, Sec-Treas. R.M. No. 379, Cavell, Sask.

An accepted cheque for the sum of $300.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of three p.m. standard time, on Wednesday, July 18th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.

Department of Highways,
Regina, Sask.
June 27th, 1923. 27

For Sale

5,000 lin. feet of 2" pipe, 5,000 lin. feet of 1½" pipe in good condition, used only two months.

1 Sawyer Massey Road Grader.

1—50 ton bin and screen, with elevator and buckets.

1,000—lin. feet Blaw-Knox 6" road forms.

1—C. H. & E. Water Pump.

1—London Paver.

1—Buffalo-Pit Road Roller.

Box 291, Contract Record, Toronto. 25-29

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 15, Section F, subsection (a)" will be received by the undersigned until eleven a.m. standard time on

Wednesday, July 18, 1923,

for the excavation of approximately 32,000 cubic yards of earth and other work required in the construction of Provincial highway from Raymore to Semans, 8 miles.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:—

Wm. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.; Jas. S. Adams, Sec-Treas. R.M. No. 279 Semans, Sask.

An accepted cheque for the sum of $700.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of three p.m. standard time, on Wednesday, July 18th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.

Department of Highways,
Regina, Sask.
June 27th, 1923. 27

FOR SALE

All Steel Derrick Car

This is a Standard, Steel Centre, Girder Construction Flat Car
36 feet long—100,000 lbs. Capacity,

on which is Erected Marsh & Henthorne Double Drum, Double Cylinder Engine with Two Independent Niggerheads;

Separate Friction, Swinging Gear Direct Connected to Engine;
Vertical Steel Boiler—Wooden Cab

All Steel Counterweight Derrick with 32 foot Steel Boom; Lifting Capacity about 5 Tons at 20 ft. Radius.

Car is Self-Propelled by Chain Drive arranged for on Both Trucks.

Complete with Cable and Blocks—
Ready for Operation.

THE MARITIME BRIDGE CO. LTD.,
27 New Glasgow, N.S.

COUNTY OF ONTARIO

Tenders For Concrete Bridge

Sealed tenders plainly marked as to contents will be received by the undersigned until 12 o'clock noon, (Standard time) on

Wednesday, July 11th, 1923

for the construction of a reinforced concrete Arch Truss Bridge, Span 80 feet, roadway 26 feet and two 5 foot sidewalks, across the Beaver River, Mara street, Village of Beaverton.

Plans and Specifications may be seen and all information obtained at the office of the undersigned.

An accepted cheque for 5% of the amount of tender, payable to the Treasurer of the County of Ontario or a Guaranty Company's bid bond must accompany each tender. The lowest or any tender not necessarily accepted.

D. J. KEAN,
County Road Supt. & Engineer
Whitby, Ont. July 2nd, 1923. 27.

TOWNSHIP OF MINTO

Tenders Wanted

Tenders will be received by the undersigned up to noon on

July 16th, 1923

for the construction of three Municipal Drains in the Township of Minto, as follows:-

Drain No. 1 Open ditch, 25,800 cu. yds. of excavation.

Drain No. 12 Open ditch, 6,455 cu. yd. excavation and 3,550 lineal feet of tile drains.

Drain No. 11 Open ditch, 17,422 cu. yds. of excavation.

Plans and profies can be seen at the office of the undersigned, Harriston, Ont.

A marked cheque for 5% of the amount of the contract must accompany each tender as guarantee of good faith and a contract bond will be required from the successful tenderer.

The lowest or any tender not necessarily accepted.

W. D. McLELLAN,
Clerk of Minto,
27-28 Harriston, Ont.

Tenders Wanted

Sealed tenders addressed to Samuel Cassel, County Clerk, Kitchener, Ont., will be received up to

July 12th, 1923

12 o'clock M., for the construction of the following:

1—1 Renforced Concrete Bridge—16′ span.
2—1 Reinforced Concrete Bridge—14′ span.
3—2 Reinforced Concrete Culverts— 4′ span.
4—1 Renforced Concrete Culvert — 6′ span.
5—1 Reinforced Concrete Culvert — 9′ span.
6—Approximately 1800 square yards concrete pavement and 800 lineal feet of concrete Curb and Gutter in the Village of Ayr.
7—Approximately 3400 square yards of Macadam Roadway and 1800 lineal feet of concrete Curb and Gutter in the Town of Preston.

Plans and specifications may be seen at the office of the County Clerk, Kitchener, Ont.

L. S. LICHTY,
27 County Road Superintendent.

Corporation of the Town of Cochrane

The undersigned will receive tenders for the construction of an Activated Sludge Sewage disposal plant for the town of Cochrane, plans and specifications of whch can be seen at the office of Contract Record, 347 Adeiaide Street West, Toronto.

Tenders will close July 19th, and contractors will be required to deposit with tender a certified cheque for 5% of contract price.

The lowest or any tender not necesarily accepted.

R. C. MORTSON,
Clerk and Treasurer,
27 Town of Cochrane, Ontario.

CONTRACTORS SUPERINTENDENT requires position; well up in reinforced concrete and all classes of construction, life long experience, excellent references, quantities and estimating, apply Box 305, Contract Record, Toronto. 27

CIVIL ENGINEER DESIRES POSITION. Sixteen years experience as resident and contractor's engineer on heavy construction work, power plants, bridge foundations and buildings. Industrial engineering and quarry experience as engineer and superintendent. Box 301 Contract Record, Toronto. 27

CIVIL ENGINEER with contracting and executive experience and the very best of references would like to make connection with a going contracting firm or hear from somebody who needs the services of such a man. Am in a position to invest some money in a sound proposition. Box 303, Contract Record, Toronto. 27

For Sale

Model 60C, Marion Shovel, 2½ yard dipper, Boiler 140 lbs. Pressure, located at Port Arthur, has worked only four months in gravel. $7,000 cash as it is and where it is. Apply Box 592, Contract Record, Toronto. 26-27

Steam Shovel for Sale

70C Bucyrus, in perfect condition, only slight minor repairs needed. Can be inspected at Woodman's Point Station near St. John, N.B. Price low. Apply A. M. McDonald, Kennedy & McDonald, Antigonish, N.S. 25-27

CAST IRON PIPE FOR SALE

30″, 24″ and 10″. Cheap.

L. S. Tarshis & Sons,
26-28 **Toronto.**

Cableway and Plant for Sale or Rent

One cable-way and plant, complete, consisting of:

1—40 H.P. Locomotive Type Boiler.
1—Pair of cable-way engines, 9 x 12.
2—A Frames and 8 sheaves. Wire, Rope, carriage, etc.
We also have stiff-leg derricks.
1—36″ Symonds Disc Crusher.
2—No. 4 Jenckes and 1 No. 3 McCully Gyratory Crushers.

And other miscellaneous equipment.

JAFFE MACHINERY EXCHANGE,
53 Montfort St., Montreal.
Main 8398. 27-28

TRANSIT MAN WANTED to assist on Township survey work. Must have previous bush experience. Apply McAuslan, Anderson & Moore, Box 805, North Bay, Ont. 27

Some One Wants to Buy

The equipment or machinery that you are not using.

It may be occupying valuable space in your yard or shop, collecting dust, rust and hard knocks.

Sell it before "Depreciation" scraps it.

Use the **Tenders & Proposals Department.** It helps others, let it help you.

To Use Huge Caisson

A pneumatic caisson of record magnitude, 1.130 by 197 ft. is to be used at Harve France, to form the foundation of a new dry dock, the one constructon including the entire area, states an American authority. The framing of the caisson will comprise six longitudinal trusses 21 feet deep and 40 transverse trusses. The dock will accommodate vessels larger than any now in existence, say of 100,000 tons displacement, being 1,024 by 174 feet and allowing a draft of 44½ ft. The weight of the caisson will be about 8,000 tons.

Spanish Hydro Development

Important new Spanish hydro-electric installations may be divided into two groups, according to the U. S. Commercial Attache at Madrid, one lying in the Provinces of Lerida and Gerona and aggregating 146,500 horsepower, the other centering at the falls of Dos Aguas and at those of the Cinca in the Argonese Pyrenees. An estimated total of 300,000 horsepower of hydro-electric installations were underway in Spain at the beginning of 1921, of which the plant of the Riegos Fuerzas del Ebro, at Camarasa Falls, Lerida was finished during that year. Power from both of these groups is transmitted to Barcelona at o voltage of 110,000.

Hydro-electric resources of Spain in actual exploitation at the begnning of 1922 are estimated at from 500,000 to 600,000 horsepower. This is only about one-tenth of the potential energy possible of development.

Construction Equipment

Concrete mixers numbering 49 and valued at $56,764 were exported from the United States to foreign countries during December, 1922, according to the records of the U. S. Department of Commerce; 18 of these mixers, costing $28,795, went to Japan, and 13, valued at $16,729, to British India.

In the bucket and belt conveyor field, December exports totalled 110 installations at $24,445. Japan again being the leading consumer.

Dredging machinery weighing 556,500 lb. and costing $78,193, was exported in December, British Honduras receiving the largest quantity of this equipment amounting to 160,632 lb. costing $33,958.

During the same month 9 cranes costing $60,171 were exported, 3 of them going to Cuba and 2 to Japan.

Hoist and derrick exports for December involved 514 units costing $48,808.

During the same month construction equipment not otherwise specified totalled 817,708 lb. valued at $130,377.

way Ave.; plumbing, A. E. Melhuish, 1174 College St., $1,799.

The following contracts for the erection of shelter buildings in Willowvale Park have been awarded by the city council; masonry, $4,408, Teagle & Son, 310 Davenport Rd.; carpentry, F. J. Murphy, 264 Ontario St.; plumbing, $1,900, A. E. Melhuish, 1174 College St.; heating, McNaughton & McKenzie, 1029 Shaw St.

Business Buildings and Industrial Plants

Cornwall, Ont.

E. Bousso, Cornwall, engineer for the Howard Smith Paper Mills, will let contracts for heating and sprinkler systems for the addition being made to the plant by P. Dore, Valleyfield, Que., at a cost of $225,000.

Hamilton, Ont.

Harry Langer, 449 Maple Ave., will have plans prepared for a store and apartments to be built on Aberdeen Ave.

Hall & Duerr, Lumsden Bldg., Toronto, are preparing plans for W. J. Lord, James St. N., for a market. Tenders will be called shortly.

Middleton, N.S.

A. W. Allen & Son, Middleton, contemplate building a woodworking factory, 45 ft. x 90 ft., concrete block construction. This company also contemplates a saw mill of similar construction, 45 ft. x 85 ft.

Moncton, N. B.

J. W. Frazer, 132 Steadman St., architect, has prepared plans for a Masonic Temple to be built in Moncton. Tenders will be called at once. Plans will also be prepared for an addition to the Barker House.

Montreal, Que.

Contracts for sub-trades for two stores and dwellings costing $25,000 will be let by J. N. Gagne, 345 Grouard St., builder.

Tenders for roofing, electrical, plumbing, heating, plastering brickwork and excavating contracts for a store and residence costing $20,000 are wanted at once by H. Cote, 300 St. Georges St. Prices on 10,000 pressed brick are also required.

Cardinal & Beauchamp, architects, 26 St. James St., have prepared plans for a public garage and will call for tenders shortly.

Ottawa, Ont.

Alterations to a store and residence costing $14,000 are contemplated by E. Monette, 76 Fairmont Ave.

Toronto, Ont.

Masonry, roofing, plastering, heating and plumbing contracts for a store costing $8,000 wil be let by W. Andrew, 1473 Gerrard St. E.

Truro, N. S.

Baird, Thomas & Scott, Truro, will have alterations made to a warehouse at a cost of $10,000. Owners will let sub-trades.

Weston, Ont.

Broks Steam Motors, Ltd., 1304 C.P.R. Building, Toronto, contemplate building a factory here. Construction is expected to commence in the fall.

CONTRACTS AWARDED

Cornwall, Ont.

General contract for an extension to the Howard Smith Paper Mills, Cornwall, has been awarded to P. Dore, Valleyfield, Que. at $225,000. Phoenix Bridge & Iron Works Ltd., Montreal, will supply structural steel.

Gull Lake, Sask.

R. Erwin, Gull Lake, general contractor is excavating for a restaurant, 25 ft. x 100 ft., concrete and brick construction, costing $18,000.

Ipperwash Beach, Ont.

N. Dailey, manager of Ipperwash Beach Hotel, will supervise the construction of a two storey hotel, concrete foundation, frame construction, estimated to cost $20,000.

Mimico, Ont.

Benett & Wright, 72 Queen St. E., Toronto, have the plumbing and heating contracts for a $30,000 factory being built here by W. E. Shenstone, Grange Rd., London, England. G. M. Miller & Co., 93 Yonge St., Toronto, architects.

Moncton, N. B.

O. J. Dunham, general contractor, Moncton, has the contract for a business block for a motion picture theatre, concrete block construction, at Oxford, N. S. The building will cost about $8.000.

Montreal, Que.

Commercial Alcohol Co., c/o John Irwin, 20 St. Paul St., has awarded Dominion Reinforcing Steel Co., the contract for reinforcing steel for the mollasses distillery the company is building on Notre Dame St. E. Canadian Metal Window Co., 169 Riel St., will supply steel sash. The contract for architectural iron has been awarded to Federal Iron Works, 1112 St. Patrick St.

Montreal, Que.

Kendal Bros., 165 Iberville St., are excavating for a $2,500,000 grain elevator for Montreal Harbor Commission. Steel contract has been awarded by the commission to Canadian Vickers Ltd., Montreal, east.

Oakville, Ont.

W. H. Hawkes, general contractor, Oakville, will build a brick theatre costing $18,000. Materials have not yet been purchased.

Regina, Sask.

T. G. Traub & Sons, general contractors, 2105 Rae St., have not yet purchased materials for an implement shed to be built in the Exhibition Grounds for Regina Agricultural and Industrial Exhibition Association, at a cost of $7,500.

St. John, N. B.

John Flood & Sons, Princess St., has the general contract for a brick garage 35 ft. x 50 ft., costing $7,000. General contractors are in the market for cement.

Toronto, Ont.

Contracts awarded for the additions to the Robert Simpson Company store are as follows: Stone, Canadian Benedict Stone Ltd., Canada Cement Bldg., Montreal; elevators and escalators, Otis- Fensom Elevator Co., Bay St., Toronto; rolling shutters, A. B. Ormsby Co. Ltd., 48 Abell St., Toronto.

Imperial Bank of Canada has awarded the following contracts for the Danforth Ave. branch; Masonry, H. N. Dancy & Son, 22 College St.; electrical, R. A. L. Gray & Co., 85 York St.; plumbing and heating, J. W. Oram, 836 Yonge St.; plastering, J. Boyce & Son, 21 Roylat Ave.

Wickett & Co. Ltd., 127 Front St. E., have the general contract for alterations to the Ault Wiborg plant, Charlotte St. The alterations will consist of an addition 55 ft. x 60 ft., mill and brick construction. Electrical, heating and plumbing contracts will be let by the architects, Sproatt & Rolph.

Residences

London, Ont.

Middlesex county council is considering the erection of a residence for the governor of the county jail. The dwelling will be built on a site adjoining the jail.

Montreal, Que.

Roofing, electrical, heating, plastering and painting contracts for two residences costing $18,000 will be let by L. Clouthier, builder, 3702 Benoni St.

P. Latendresse, 3302 St. Lawrence Blvd., will let masonry, roofing, electrical, plumbing and plastering contracts for a brick residence costing $14,000.

J. H. N. Hauteux, 762 Henri Julien St., will let masonry, roofing, electrical, plumbing, plastering and painting contracts for two residences costing $30,000.

B. O. Adam, 51 Christophe Clombe St., is receiving tenders for masonry, rofing, plastering, plumbing and heating for a $9,000 residence.

Tenders for masonry, electric wiring, plumbing, plastering and painting for a $10,000 residence will be let by E. Brazeau, 2077 Boyer St.

Ottawa, Ont.

J. S. Wilson, 256 Kent St., is excavating for an apartment house estimated to cost $100,000. Approximately 20,000 brick and materials for 40 cubic yards of concrete and 1,000 square yards of plaster will be required together with other materials necessary for construction.

Ste. Dorothee, Que.

Napoleon Goyer, Ste. Dorothee, contemplates the construction of a residence two storeys high stone and brick construction, costing $8,000.

St. John, N. B.

Armstrong & Bruce, 103 Prince William St., propose to build ten residences costing $50,000. Materials for these dwellings have not yet been purchased.

Toronto, Ont.

Tenders are being reecived by R. C. Cummings, 417 Beresford Ave., for plumbing, heating, electrical and plastering contracts for a residence being built on High Park Ave., at a cost of $8,500.

Roofing, plastering, electrical, heating and plumbing contracts for a residence costing $20,000 will be received by W. Pendleton, 615 Greenwood Ave.

Plans have been jprepared by D. H. Burnham, 260 Lauder Ave., for a $7,500 residence for W. E. Smyth, 327 Lauder Ave. The dwelling will be stone and

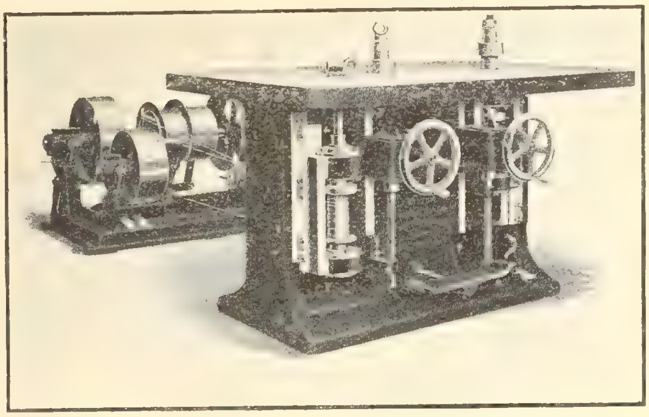
Chosen on Their Merits

"Preston" Machines Being Furnished for the Riverdale Technical School, Toronto—

Orders have been secured from the Riverdale Technical School, Toronto, for the following "Preston" woodworking machines:

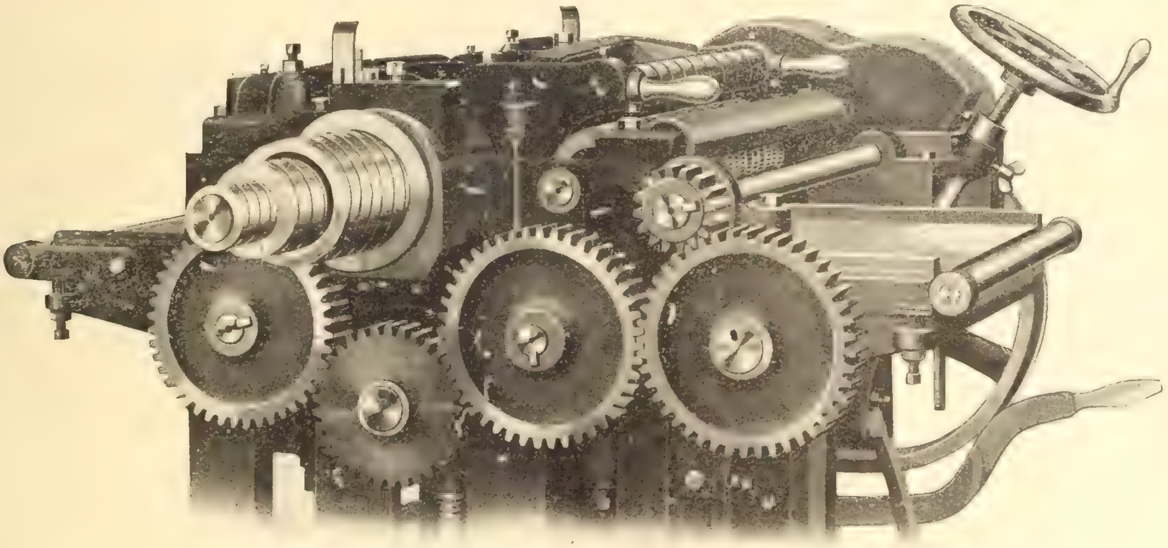
- 2 Ball Bearing Buzz Planers.
- 2 Ball Bearing Band Saws.
- 1 Ball Bearing Pony Planer (this machine equipped with round cylinder, sectional rolls and sectional chipbreaker)
- 1 Stockbridge Electric Knife Grinder.
- 1 High Speed Ball Bearing Shaper.
- 1 Ball Bearing Belt Sander.
- 1 Ball Bearing Sand Riddle.

We have also secured order for 22 machines for the Windsor Technical School, Windsor.



No. 162 "Preston" High Speed Ball Bearing Shaper

We are perhaps better posted on the Woodworking Machinery requirements of a Technical School than any other concern in Canada. We offer you **the accumulated result of our years of experience.** All our stock of valuable information is freely at your disposal and we know that schools just starting can save themselves a lot of **expensive trouble** by availing themselves of this offer which we make freely and without any other obligation than possibly a chance at their business when they are in the market.



No. 121—"Preston" Pony Planer
Equipped with sectional rolls and sectional chipbreaker

The Preston Woodworking Machinery Company Limited

PRESTON, ONT., CANADA

brick construction, two storeys high. Contracts for electrical, heating, plumbing and plastering will be let. Materials have not yet been purchased.

Westmount, Que.
John Allan, 200 Atwater Ave., general contractor, will let sub-trades for a residence costing $35,000.

CONTRACTS AWARDED

London, Ont.
H. Jones, 374 Tecumseh St., has been awarded the general contract for a two storey brick residence for E. J. James, 394 Piccadilly St., costing $9,000.

Webster Construction Co., 134 Carling St., general contractors, will build a $10,000 two storey brick residence for F. W. Gladman, Bank of Toronto Bldg.

R. G. Wilson & Son, 398 Talbot St., have the general contract for a residence two storeys high, concrete and brick construction, costing $14,000.

Moncton, N. B.
LeBlanc & Richardson, Moncton, have the contract for an $8,000 residence for Ross Smith, William St.

Montreal, Que.
1. Vantrin, Apartment 2, 1040 St. Hubert St., has awarded the following contracts for a $25,000 residence: Brick, National Brick Co. Ltd., 1024 Canada Cement Bldg.; roofing, R. Turcot, 1681 Clark St.; electrical, H. Lamarce, Delorimer St.; plumbing, J. A. Francouer, 538 Fabre St.

Nicholson Construction Co. Ltd., 950 Catherine St., Montreal, have the general contract for alterations to the residence owned by J. K. L. Ross estimated to cost $30,000.

Ottawa, Ont.
The general contract for a residence costing $10,000 has been awarded to A. E. Shaver, 255-1st Ave. About 9,000 bricks and materials for thirty cubic yards of concrete will be required.

John Sutherland, 510 Rideau St., has the plastering contract for a $35,000 residence which is being built for J. R. Booth, Jr., by Holbrook & Son, Hope Bldg.

Toronto, Ont.
McCluskey & Feast, 66 Runnymede Rd., have the plastering contract for a $20,000 residence being built on Oriole Parkway by Burk & Co., 18 Toronto St.

Power Plants Electricity and Telephones

Bryson, Que.
Ottawa & Hull Power Co. Ltd., contemplate building a dam and power house at Cat Calumet Island Falls, Ottawa River, and plans will be prepared by Wm. Kennedy & Sons, Ltd., 232 St. James St. Montreal.

Miscellaneous

Hamilton, Ont.
Hamilton Harbor Commission, 47½ Main St. E., have passed estimates for new piers at Burlington Beach south costing $53,000.

CONTRACTS AWARDED

Edmonton, Alta.
Ford, Bacon & Davis, New York, U.S.A., have awarded Williams Bros., Tuls Oklahoma, U. S. A., the contract for a $3,500,000 gas pipe line from Viking to Edmonton. This contract includes all work except twelve and a half miles of the main line at Viking.

Late News

Brantford, Ont.
Brantford city council will be asked to allow the water commission to apply to the Ontario Railway Board for permission to issue $100,000 worth of debentures for capital expenditures necessitated by the demands of outlaying districts for water connections.

Hamilton, Ont.
Wentworth Suburban Roads Commission has awarded Hamilton Contracting Co. Ltd., Home Bank Bldg., Hamilton, the general contract for a concrete pavement in Barton and Binbrook townships costing $25,000.

Hartland, N. B.
Tenders for the construction of a two storey brick and steel school will be received by the school board until July 7. J. S. King, secretary of the board.

Sandwich, Ont.
Tenders for the paving of the following streets will be called by the town council shortly: Fauchette St., with curbs Randolph to California Ave.; King St.; Peter St.; Alexander Ave. from Detroit to Rosedale Ave.; Rosedale Ave. from London to Peter St.

Watermains on the following streets are contemplated by the town council: Bloomfield from South St. to Prince Rd.; Alexander St. on both sides; Baley St. from Chippewa St. to South St., across Lot 1; Partington Ave. from Wyandotte St. to Craig St.; Craig St. from the end of the existing main to Partington Ave. Tenders are expected to be called shortly.

Scotstown, Que.
Letters patent have been issued to the Scotstown Granite Co. Ltd., Scotstown, to quarry, manufacture and market stone and other building materials. Capital is $250,000.

Terrebonne, Que.
Tenders will be received by the town clerk, E. Labelle, until July 15 for the construction of a concrete and iron bridge.

Thetford Mines, Que.
The Province of Quebec has issued letters patent incorporating Lynn McLeod Engineering Supplies Ltd. The company will deal in machinery and builders supplies. Capital $10,000. Head office is at Thetford Mines.

Toronto, Ont.
The Civic Works Committee has adopted Commissioner Harris' report favoring the construction of a system of drainage for North Toronto at an estimated cost of $11,121,525 to be carried out on the local improvement basis.

A Dominion Charter has been issued to the Tomlinson Construction Co., Toronto, capital $100.000. The company will operate as engineers and general contractors.

Vancouver, B. C.
Leith, Murray & Co. Winch Bldg., Vancouver, have the general contract for the construction of a terminal railway for the Vancouver Harbor Board. The work will consist of laying several diamond crossings, safety and interlocking switches, rails and other track materials.

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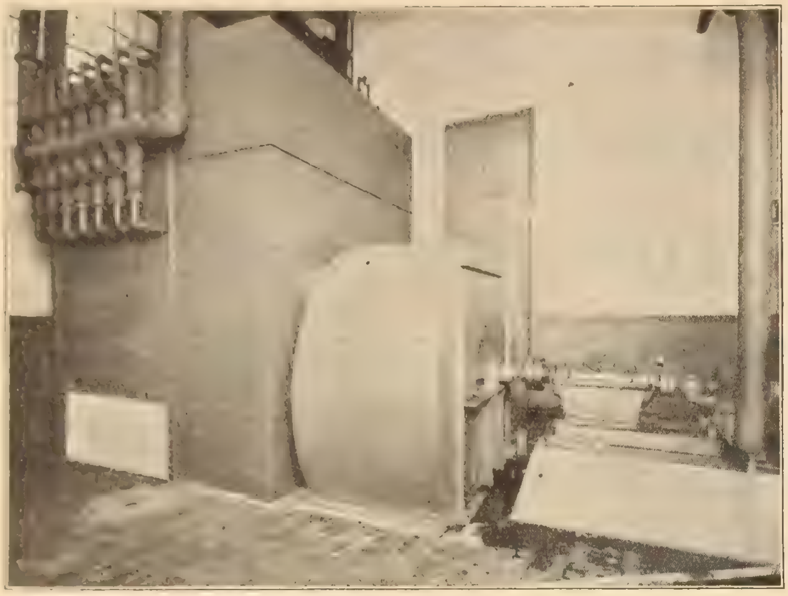

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PUTS AIR TO WORK

Additions to Wood Block Specifications

Two new sections were added to the specifications for wood block street paving and flooring which for some time have been before the American Wood Preserves Association, states an American authority. The specifications were adopted as standard. Bituminous mastic cushion consisting of 10 per cent of bitumen, either coal tar or asphaltic oil, and 90 per cent of clean, dry screened sand may be used instead of a cement-mortar cushion. To permit the mastic to cure it is to be spread a day in advance of laying the blocks. A maintenance clause calls for inspection each summer and a surfect treatment of light tar (1/4 to 1/3 gal.) and sand when the pavement shows signs of shrinkage or open joints.

To Finish St. Paul Union Station

A contract awarded recently by the St. Paul Union Depot Co., St. Paul, Minn., to Foley Bros., of that city, provides for the completion of the new union station. The total cost of this work will be about $2,000,000, of which probably $900,000 will be spent this year, the remainder of the work being extended over the next two years.

North Carolina Awards Contracts

North Carolina State Highway Commission recently let contracts for sixteen projects, totaling 126.37 miles and costing $2,697,754, exclusive of the usual 10 per cent for engineering and contingencies. Of this mileage 54.97 miles were either of concrete, or asphaltic surface on 5-in. concrete base. The average cost per mile for this work was 31,644.

Denver Authorizes Bond Issue

Bonds to the amount of $6,500,000 were authorized at a municipal election held in Denver, Colorado, recently. The proceeds will be used for extending and enlarging the distribution system, constructing a conduit from Marston Lake to Denver and building a filter plant. Burton Lowther is chief engineer of the Denver municipal waterworks. Bonds are to constitute a lien on the system and are to be retired out of revenues from which will also come the interest.

Paris Plans Sidewalk Underground

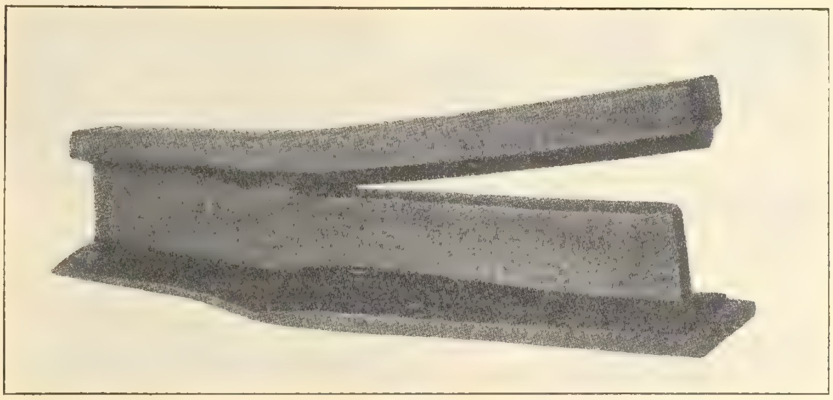
Of thirteen plans submitted for the proposed underground moving sidewalks for paris, five will be retained for experiment, according to The Engineer, London. These five will be tested over a circular distance of 300 m., in two groups. The four plans of the first group are based on the principle of parallel bands at graduated speeds, enabling passengers to step from one band to another until the most rapid is reached; landing places would be alongside the slowest band. The fifth plan is based on the idea of variable speed, slow movement at stations and higher speed between stations.

South African Railroads

It is reported that a bill has been introduced in the Parliament of the Union Government of South Africa Provding for the immediate construction of 22 short railway connections, aggregating 851 miles of line, which will involve an expenditure of substantially $20,000,000.

BURLINGTON STEEL
COMPANY, LIMITED

HAMILTON CANADA



"Close-up" of a rail part of which has passed through the slitting mill. Showing how the rail is slit into three separate parts—the head, web and flange.

The Re-rolled Argument

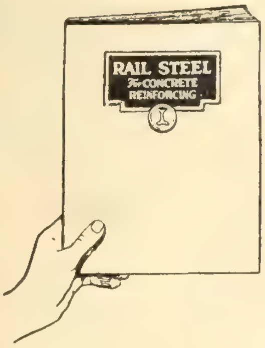
Rail Steel Reinforcing Bars are sometimes referred to as being "re-rolled." This term applied to Rail Steel is a misnomer.

In rolling Rail Steel Bars, the rail is separated into three parts, the head, web and flange; and these parts are treated individually as billets and rolled into bars, or other sections. The Rail Steel Bar is the result of a continuation of the rolling process, and is in no sense a "re-rolled" product.

The objection to the term "re-rolled" is that it permits confusion of Rail Steel Bars with bars re-rolled from various kinds of scrap, shell discard, etc.

It is important to note that the A.S.T.M. Specification A-16-14 covers "Rail Steel Concrete Reinforcement Bars," and no mention is made of "re-rolled" bars. Furthermore, under "Process" this specification stipulates that the "bars shall be rolled from standard section Tee Rails."

Rail Steel Bars are not "re-rolled" bars, and if you specify bars to meet A.S.T.M. Specification A-16-14, no undesirable re-rolled material can be substituted.



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The first and only authoritative and comprehensive treatise on concrete Reinforcing Bars and containing most important information on the manufacture, qualities, and use of Rail Steel Bars.

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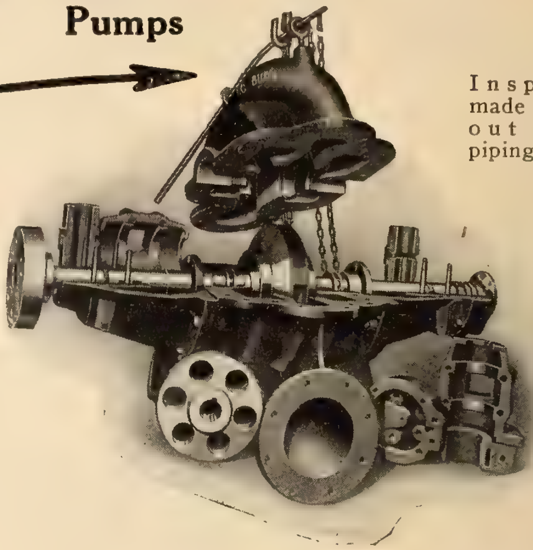

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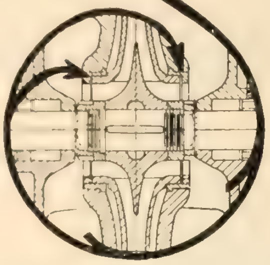

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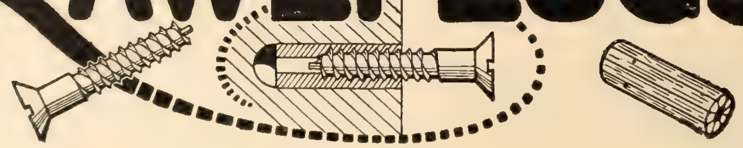

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From an English Firm of Engineers

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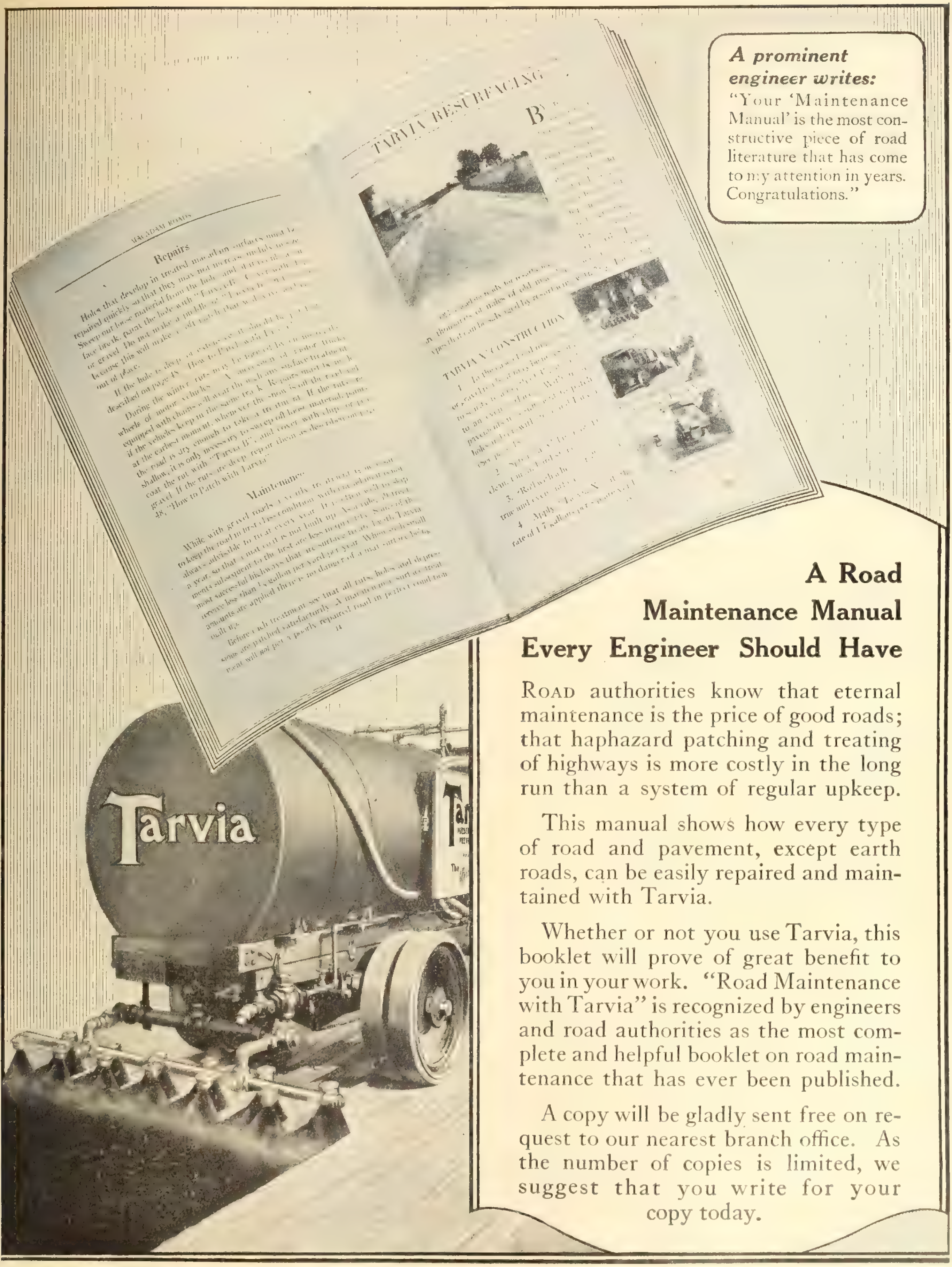
Sterling Specialties, 213 Somerset Building, Winnipeg, Man.
Sales Agents wanted in Ottawa

Blackadar & Stevens, 139 Roy Building, Halifax, N.S.
H. G. Evans, 58 Water Street, St. John, N.B.
Frank Raw & Co., 325 Howe Street, Vancouver, B.C.



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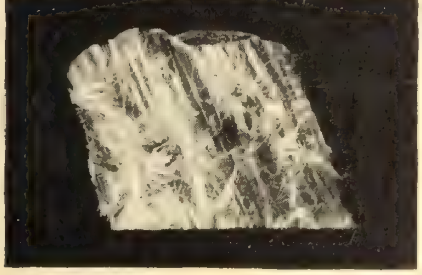
Johns-Manville Asbestos Roofing, Post Street Transformer Station, Washington Water Power Company, Spokane, Wash.

Johns-Manville Asbestos Roofing, on Long Lake Plant, Washington Water Power Company. Also used at this company's Little Falls Plant (not shown).



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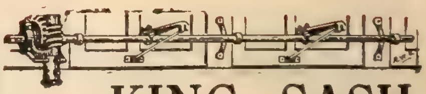

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Current Prices of Building and Engineering Materials

		Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.45
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	10.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	25.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*†	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	25.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00**	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base	4.00 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.00 "	5.10 base	
Hoops	per 100 lbs.	5.00 "	3.75 "		
Twisted and deformed bars	per 100 lbs.	3.90 "	4.00 "	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	4.00 "	4.00 "	5.35	6.00
Structural shapes	per 100 lbs.	3.90 "	4.25 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.15	6.25
Plates—3/16 in.	per 100 lbs.	4.40 "	4.25 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.50 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.50 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
Cast iron pipe	per ton	65.00 "	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.45	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
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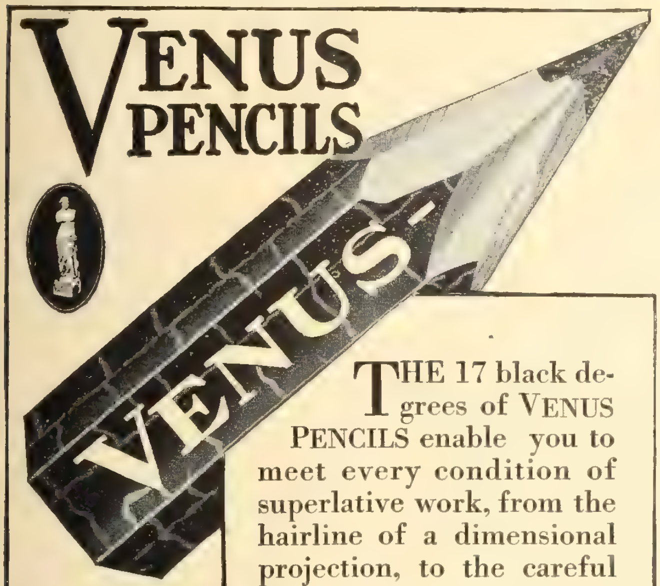

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Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	45.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	135.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	145.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.50	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	70.00

PAINTS, OILS, COLOURS (delivered):—		Toronto	Montreal	Winnipeg	Vancouver
White lead ground in oil, less than ton lots	per cwt.	15.00	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	14.50
Putty in bulk	per cwt.	5.95	4.25	5.50	6.50
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.43	1.40	1.26	1.56
Raw linseed oil, in bbls.	per gal.	1.40	1.38	1.23	1.53
Turpentine, in bbls.	per gal.	1.70	2.20	2.50	2.80
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45

PLASTER (Delivered):—		Toronto	Montreal	Winnipeg	Vancouver
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	26.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50

LABOR:—		Toronto	Montreal	Winnipeg	Vancouver
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.25	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers (Common)	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Laborers (Skilled)	per hr.	.60-.70			.90
Sheet Metal Workers	per hr.	.80			

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

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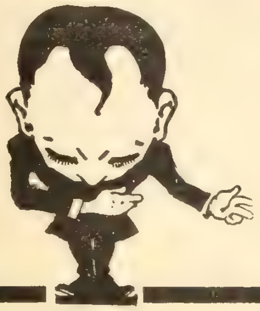

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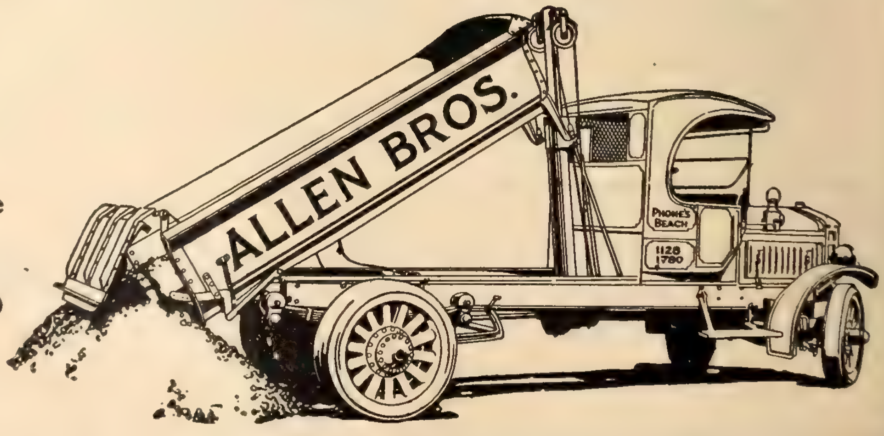

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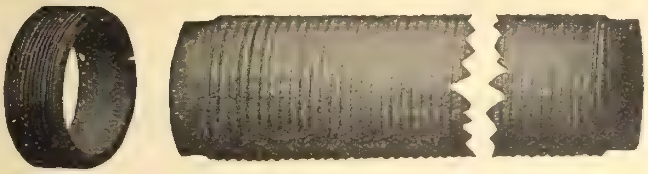

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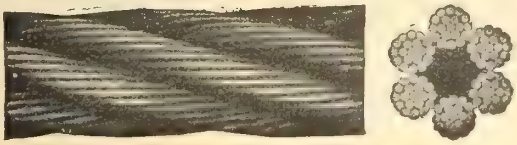

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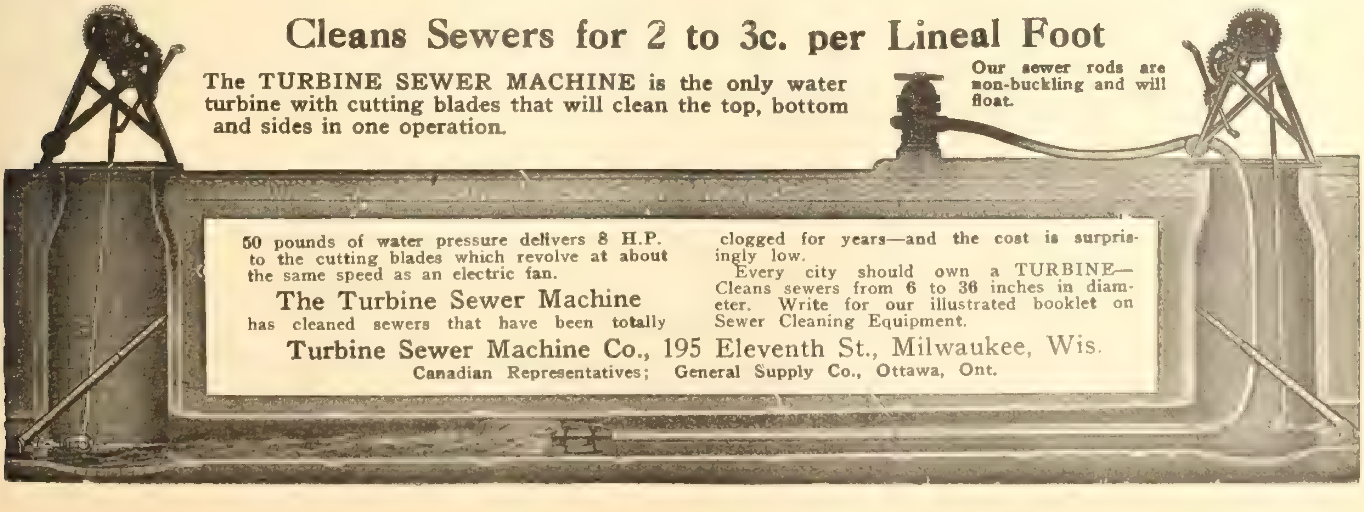

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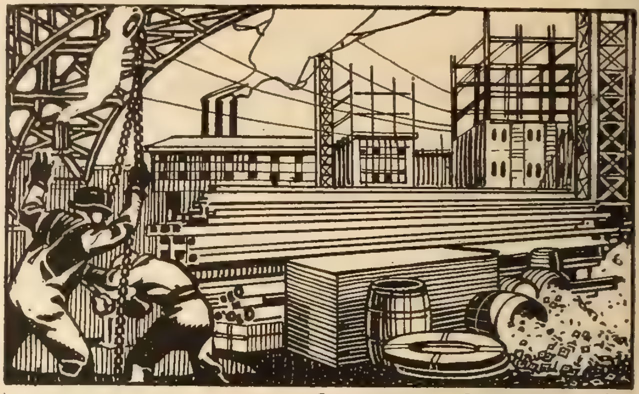

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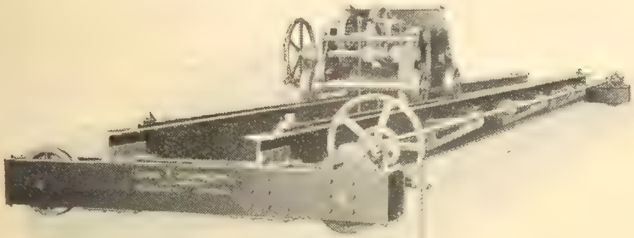

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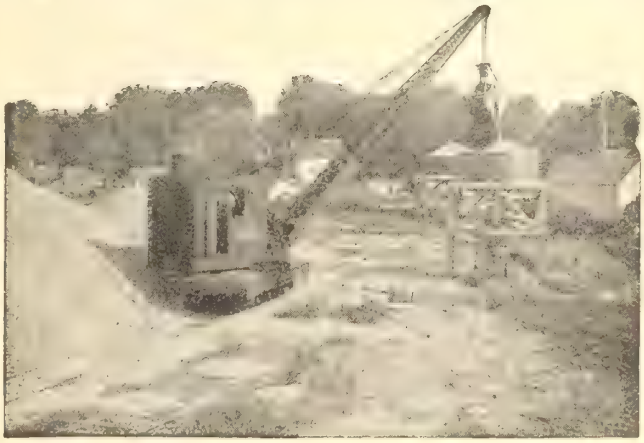

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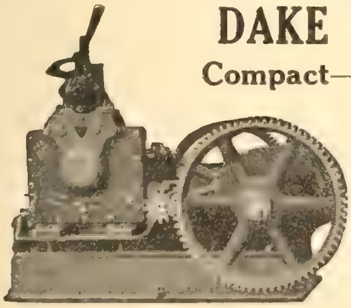

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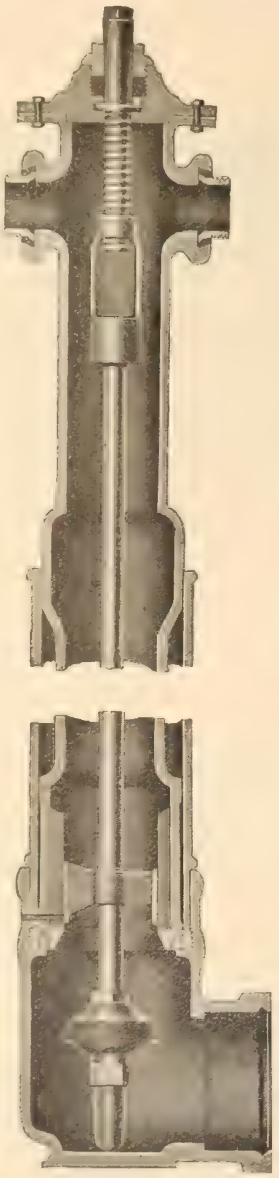

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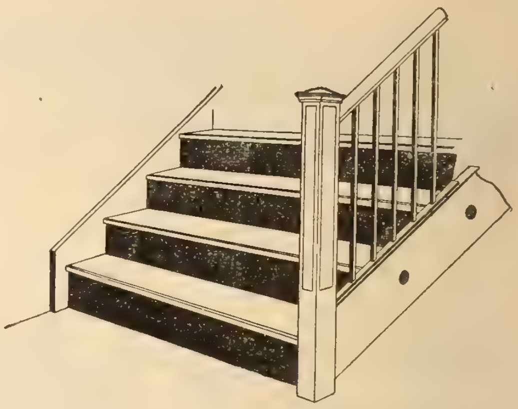

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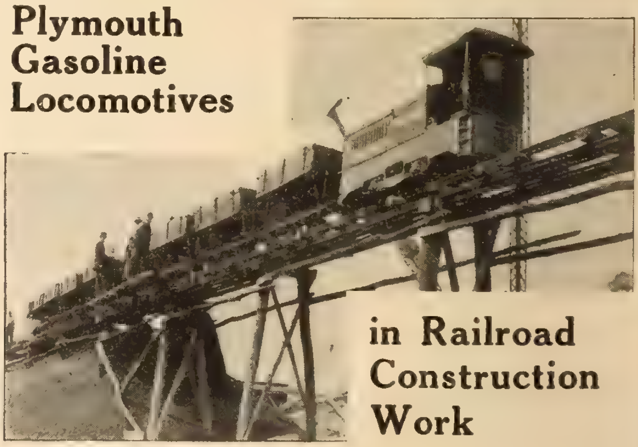

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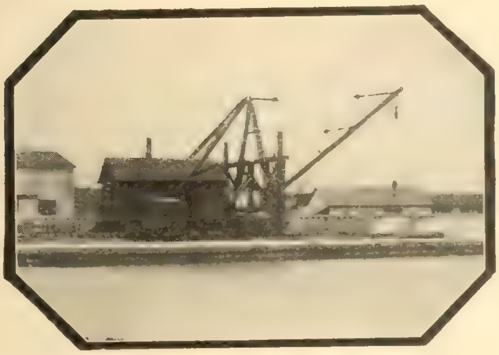

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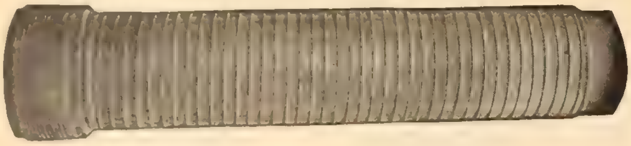

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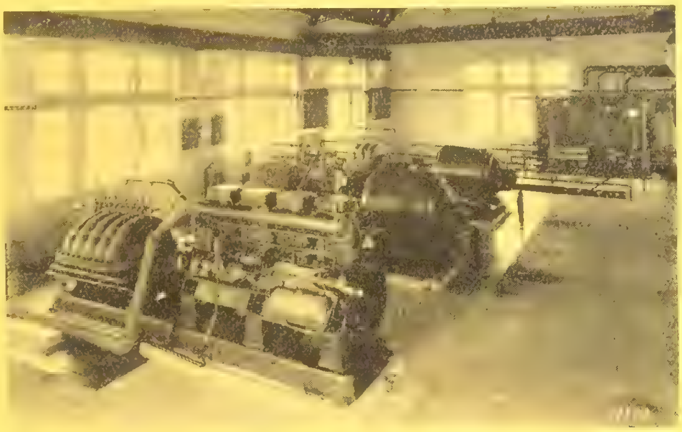

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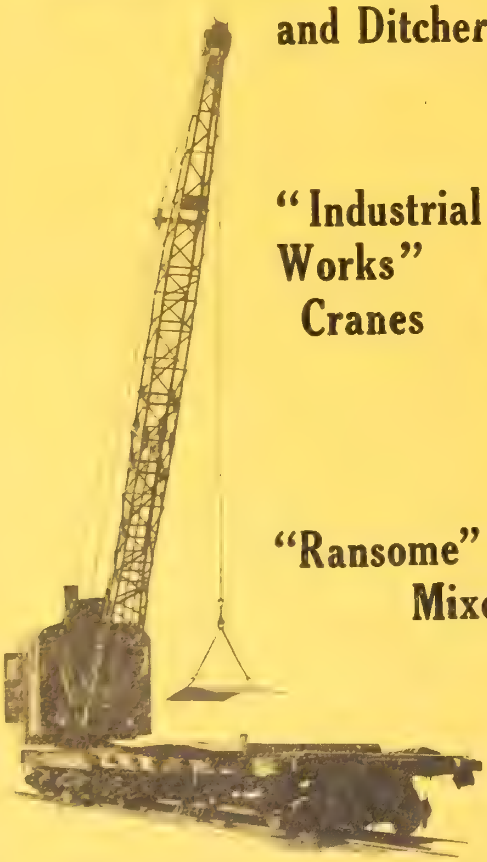

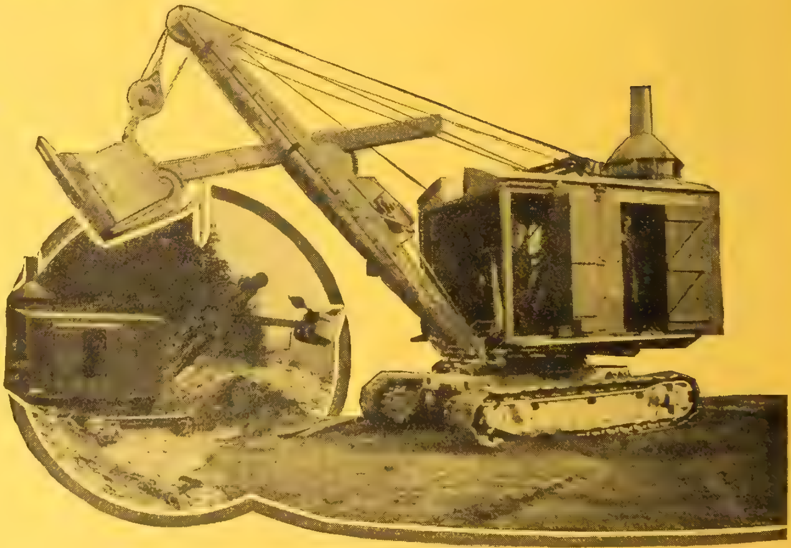

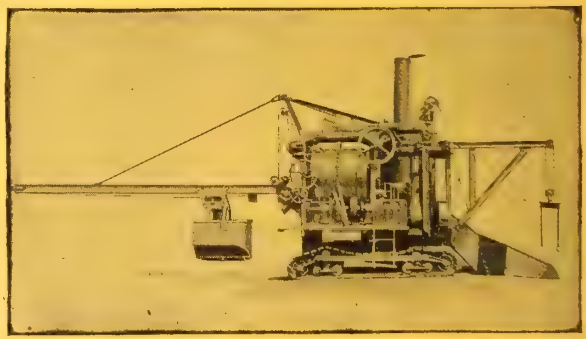

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Boucherville, P. Q.

Surface Treatment

The surface of waterbound macadam, and even gravel and earth roads, can be very effectively treated with Imperial Liquid Asphalt. Scientifically graded to meet individual requirements, this asphalt is easily applied without the aid of expensive equipment. It gives excellent results, preserves the road in good condition, prevents dust and vastly improves traffic conditions. Shipment by tank car recommended, or in barrels if preferred.

ROAD ENGINEERING DEPARTMENT

Imperial Oil Limited

Toronto Canada

IMPERIAL

Asphalt PRODUCTS

Alphabetical Index to Advertisers Page 16 Classified Directory to Advertisements Page 6

A view of our 36″ Continuous Stave

Wood Pipe

in the famous Capilano Pipe Line which, after serving Vancouver City faithfully for over 15 years, is still in its infancy.

C. S. Pipe

is used successfully for hydro-electric purposes up to 14 ft. in diameter.

TANKS
and SILOS to Order
Any Size—Any Style

CONTINUOUS STAVE
Wood Pipe
or WIRE WOUND

YOU CAN NO LONGER RECKON WITHOUT WOOD PIPE

We have enthusiastic customers willing to assure you that recent improvements have so increased efficiency and durability as to place **Wood Pipe** on a plane with Cast Iron. These features at a low initial cost, combined with ease of transportation and installation, spell true **Economy.**

When writing for information and prices please specify diameter and pressure

Our Electric-Butt-Welded
STEEL
DOUBLE COUPLING
with Inside Ring
Galvanized

has
entirely
eliminated
joint leaks
and has
perfected
WIRE WOUND PIPE

Canadian Pipe Company, Ltd.

550 Pacific St., VANCOUVER, B. C.

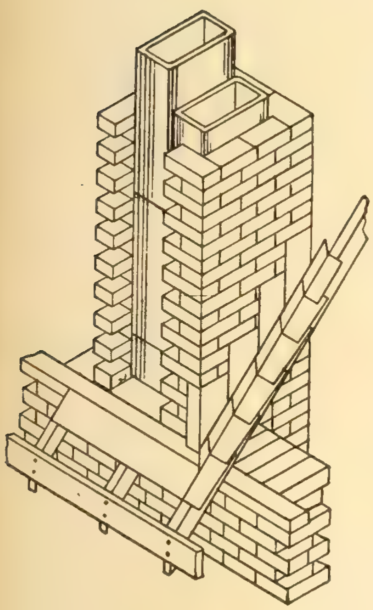
VITRIFIED CLAY FLUE LININGS

Revised List as Manufactured in Ontario

RECTANGULAR FLUE LININGS

Listed by the Outside Dimensions

Outside	Shell	Inside	Flue Area	Lbs. per Ft.
4½″x 8½″	¾″	3″x 7″	21 Sq. In.	16.
4½″x12½″	¾″	3″x11″	33 "	24.
8½″x 8½″	¾″	7″x 7″	49 "	20.
8½″x12½″	13/16″	6⅞″x10⅞″	74 "	30.
12½″x12½″	⅞″	10¾″x10¾″	115 "	40.
12½″x17″	1⅛″	10¼″x14¾″	151 "	60.
17″x17″	1⅛″	14¾″x14¾″	216 "	80.



ROUND FLUE LININGS. Listed by Inside Diamr.

Inside Diam.	Shell	Outside Diam.	Flue Area	Lbs. per Ft.
6″	⅝″	7¼″	28 Sq. In.	13.
8″	¾″	9½″	50 "	22.
9″	13/16″	10⅝″	63 "	27.
10″	⅞″	11¾″	78 "	32.
12″	1″	14″	113 "	40.
15″	1¼″	17½″	176 "	65.
18″	1½″	21″	254 "	95.
21″	1¾″	24½″	346 "	130.
24″	2″	28″	452 "	175.

For information regarding Flue Linings as manufactured in Eastern and Western Canada write to Vitrified Clay Pipe Publicity Bureau, 9 Wellington St. East, Toronto. St. John's P.Q. New Glasgow, N.S.

FILE THIS SHEET FOR FUTURE REFERENCE

JENKINS
Indicator Posts

Approved by The Fire Underwriters

The same careful designing, the same expert workmanship, the same high manufacturing standards are embodied in the making of these Jenkins Indicator Posts as in the justly famous Jenkins Diamond Marked Valves.

These Indicator Posts function satisfactorily and will stand the strain of severe usage so detrimental to inferior equipment.

When ordering be sure and specify depth of trench.

Jenkins Indicator Posts and the complete line of Jenkins Diamond marked Valves are pictured and described in Catalog No. 9—free on request.

TRADE JENKINS MARK

Jenkins Bros

A Trade Mark of Quality

JENKINS BROS., LIMITED
Head Office and Works:
103 ST. REMI ST., MONTREAL
Sales Offices: Toronto, Vancouver
European Branch:
6 Great Queen St., Kingsway, London W.C. 2, England
Factories: Montreal, Bridgeport, Elizabeth

Always marked with the "Diamond"
Jenkins Valves
SINCE 1864

Moves over soft and muddy ground without planking

CLIMBS GRADE as steep as 30 per cent. (engineer's measurement).

POWER STEERING from the cab. No man needed on the ground. COMPLETE LUBRICATION which gives greater speed and more power.

A RELIABLE Caterpillar type Steam Shovel

Excavating men tell us, "It is the greatest improvement in excavating machinery in the past 10 years." We'll be glad to send you more information about the ERIE caterpillar type mounting. Just write for Bulletin C-60.
Erie Steam Shovel Co., Erie, Pa., U.S.A.

ERIE Revolving Shovels

ERIE Steam Shovel Co.

FOR SALE

1—40 Ton Brown Hoist Locomotive Crane, bucket operating.
1—Model 76 Marion Steam Shovel.
1—Model 20 Marion Steam Shovel.
1—Fully Revolving Thew Steam Shovel.
30—20 yd. Standard Gauge Ballast Cars.
50— 6 yd. Standard Gauge Contractors Dump Cars.

Eastern Equipment Co.
Limited

MONTREAL, QUE. **DORVAL, QUE.**
P. O. Box 792

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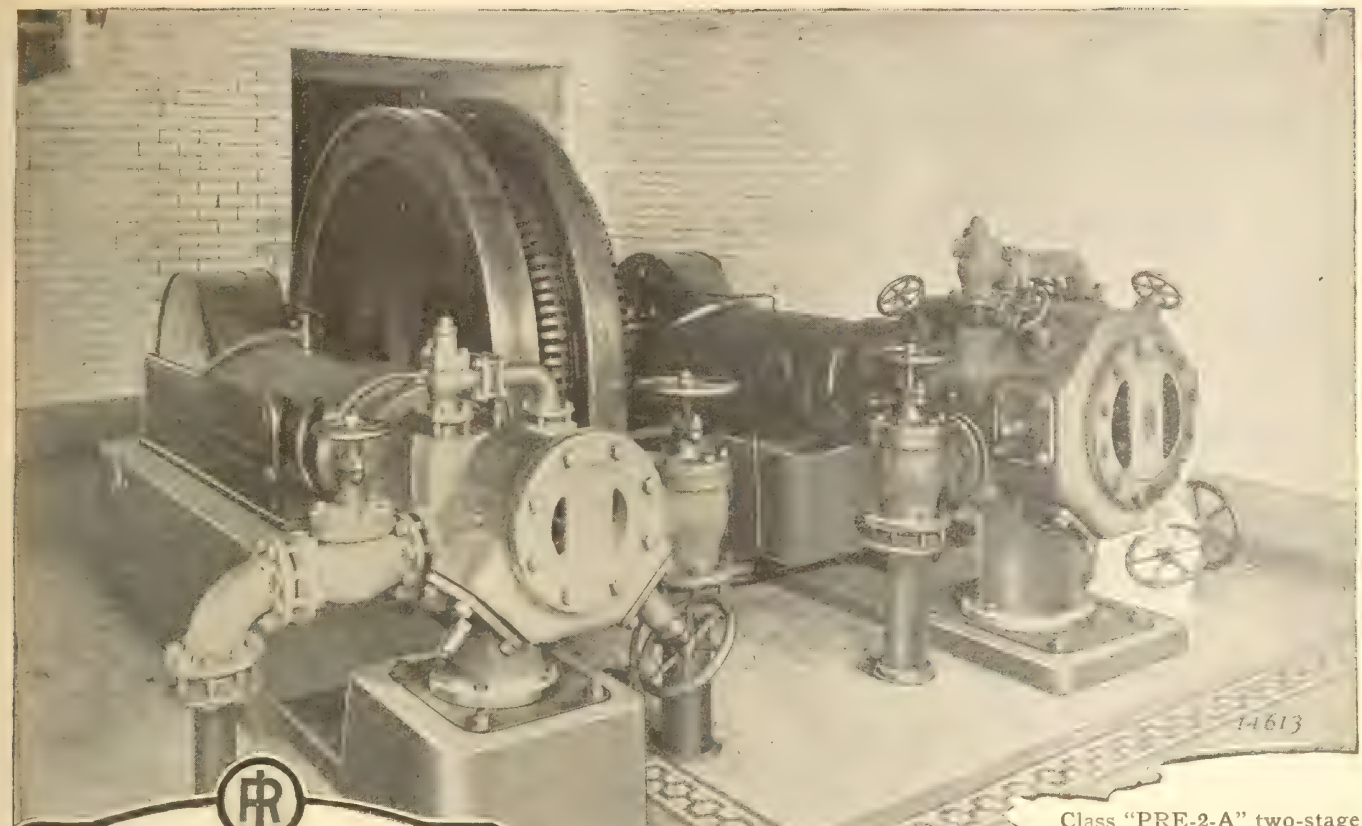
Lumber Crayons
Lumber Rules
Hardware of every description.

Hardware Co. of Toronto Ltd.
Phone Main 94
46 ADELAIDE ST. WEST, TORONTO



Class "PRE-2-A" two-stage direct-connected electric motor driven ammonia compressor. Equipped with Ingersoll-Rand Plate Valves and clearance control pockets permitting operation at full ¾ or ½ capacity.

Ice and Refrigeration Plant Equipment

Ammonia Compressors

Built for either single or two stage operation, and for belt, steam, oil engine or direct connected electrical motor drive.

Air Compressors

Can be furnished in all sizes and for any commercial discharge pressure. These units are particularly suitable for supplying air for agitation, Air Lift Pumping or for general power purposes. Any type of drive.

Air Hoists

Built in five sizes for from 1,000 to 10,000 pounds capacity. These hoists are extensively used for lifting ice cans and for general hoisting work. They are easy to move about the plant, and simple to operate.

Pneumatic Tools

A complete line of riveters, drills, grinders, etc., for erection, assembly and repair work.

Cameron Pumps

For pumping brine, water and other liquids. These can be furnished in direct-acting type for steam or compressor air drive, or in centrifugal type for belt, motor, steam, oil or gas engine drive.

Price Oil Engines

Of the direct-injection, four-cycle type. Horizontal, single cylinder types of 50 and 100 H.P., and vertical, multi-cylinder types from 105 to 1,000 H.P.

5 AC

"Ingersoll-Rand" Ammonia Compressors

The Canadian Ingersoll-Rand Company take pleasure in announcing that they are now building at their Sherbrooke Factory a complete line of Ammonia Compressors, designed to meet the requirements of modern raw water ice manufacturers, creameries, ice cream factories, cold storage plants and industrial refrigeration in general.

These machines are available in straight line and duplex types for single or two stage compression and for belt, steam, oil engine or electric motor drive. They are built in sizes suitable for small, medium or large size plants and are declared by experienced Refrigerating Engineers to permit the attainment of efficiencies and operating economies but seldom heretofore approached by equipment of this kind.

Bulletins and complete information regarding any or all types will be furnished on request.

Canadian Ingersoll-Rand Company, Limited

Sydney Sherbrooke Montreal Toronto Cobalt
Winnipeg Nelson Vancouver

Ingersoll-Rand

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The following regulations apply to all advertisers:—Eighth page, every issue, three headings; quarter page, six headings; half page, twelve headings; full page, twenty-four headings

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  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.
- Air Compressors
  - Canadian Ingersoll-Rand Co.
- Air Washers
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  - Don Valley Brick Co.
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  - Standard Steel Construction Co.
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  - Hamilton Bridge Works Co.
  - Horton Steel Works, Ltd.
  - McGregor & McIntyre
  - MacKinnon Steel Company
  - Sarnia Bridge Company
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  - Canadian Austin Machinery
  - Canadian Link-Belt Co.
  - Canadian Mead-Morrison Co.
  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
  - Jeffrey Manufacturing Co.
  - Orton & Steinbrenner Co.
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  - Industrial Works
- Buckets, (Grab)
  - Industrial Works
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  - Rogers Supply Co.
  - Vitrified Clay Pipe Publicity Bureau
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  - Canadian Mead-Morrison Co.
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  - Hepburn, Ltd., John T.
  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
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  - Buckeye Traction Ditcher Co.
  - Canadian Austin Machinery
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  - Mussens Limited
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  - Ball Engine Co.
  - Buckeye Traction Ditcher Co.
  - Canadian Austin Machinery
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  - Canadian Equipment Co.
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- Dredges
  - Canadian Equipment Co.
  - Canadian Mead-Morrison Co.
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  - MacKinnon Steel Company
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  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co.

(Continued on page 8)

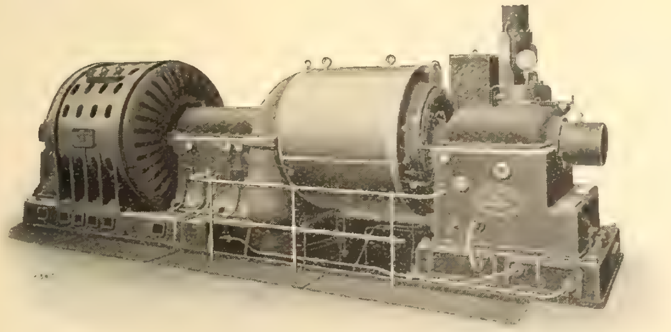
The Hamilton Bridge Works Company Limited

Head Office and Works: Hamilton, Canada
Branch Office, 410 General Assurance Bldg. Toronto, Canada

STRUCTURAL STEEL
Engineers, Manufacturers
and Contractors

Steel Railway and Highway Bridges, Buildings, Girders, Crane Runways, Towers, Turntables, Trusses, Columns, Mine Buildings, Head Frames, Bins and other plate work.

We carry a large stock of Structural Shapes and plates and can make prompt shipment on orders for plain material.



Steam Turbine

BELLISS & MORCOM LTD.
BIRMINGHAM ENGLAND

STEAM TURBINES STEAM ENGINES
AIR COMPRESSORS CONDENSERS
DIESEL ENGINES

RUSTON & HORNSBY
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Electric Water Systems
H. Mueller Mfg. Co., Limited

Electrical Specialties
Spielman Agencies Regd.

Electrical Contractors
[illegible]

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Turnbull Elevator Company

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Lea, R. S. & W. S.

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Buckeye Traction Ditcher Co.
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Canadian Equipment Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Engineering & Machine Works of Canada Ltd.
Erie Steam Shovel Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
Lumsden Engineering & Contracting Co.
Mussens Limited
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Sturtevant, B. F. & Co.

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Fans, Disc
Canadian Blower & Forge Co.
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Sturtevant, B. F. & Co.

Fans, Multivane
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Sturtevant, B. F. & Co.

Fans, Propeller
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Fans, Silentvane
Sturtevant, B. F. & Co.

Filters, Water
Laurie & Lamb

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National Fireproofing Co.

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Floor Stands
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National Fireproofing Co.
Vitrified Clay Pipe Publicity Bureau

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Wood Hydraulic Hoist & Body Co., Ltd.

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Canadian Ingersoll Rand Co.
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Mussens Limited
Watson Jack & Co.

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McGovern, T. J.
Mussens Limited
Turnbull & Co., Harvard

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Kerr Engine Company
Gartshore-Thompson Pipe Co.
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Muldoon, Ltd., J.
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Ice Making Machinery
Canadian Ingersoll Rand Co.
York Manufacturing Co.

Industrial Cars
Canadian Austin Machinery
Canadian Equipment Co.
Hopkins & Co., Ltd., F. H.
MacKinnon Steel Company
Mussens Limited

Inspection Engineers
Canadian Inspection & Testing Laboratories
Hunt & Co., Robt. W.
Milton Hersey Company

Insulating Compounds
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.
Standard Underground Cable Co., of Canada Ltd.

Jib Cranes (all kinds)
Hamilton Bridge Works Co.

Joist Hangers
Hamilton Bridge Works Co.

Kilns
Canadian Blower & Forge Co.
MacKinnon Steel Company

Lead Pencils
American Lead Pencil Co.

Lime
Standard Lime Co.
Muldoon, Ltd., J.

Hydrated Lime
Standard White Lime Co.

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Canada Wire & Iron Goods Co.

Locomotive Cranes
Ball Engine Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Link-Belt Co.
Erie Steam Shovel Co.
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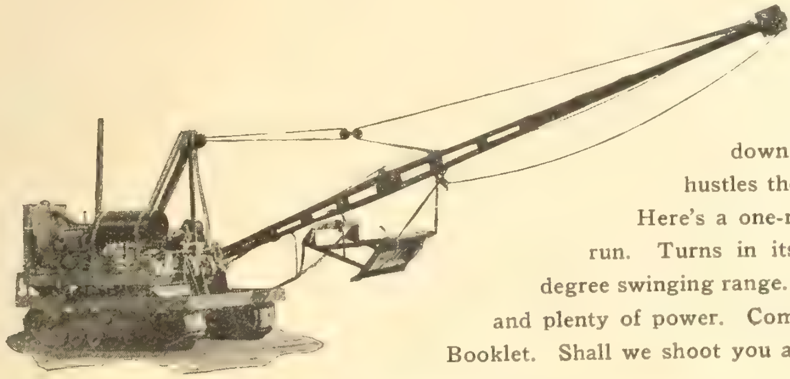
It's a *Comfortable* Sort of Feeling

Makes you feel kinda good to know that the company you've bought a machine from is going to take care of you. Here's a contractor way out in Los Angeles—Harper D. Churchill. He writes us:

"I chose a Buckeye after carefully checking their performance and specifications. At this instance, I wish to go on record that the Buckeye organization is the squarest and easiest to do business with that I know of. Your wants are taken care of promptly and efficiently. They make you feel as though they are interested in your welfare. This alone would make us give them all our future business."

That's putting it pretty "strong." But you'll find most Buckeye owners strong for Buckeyes and the service that goes with 'em. Put a Buckeye on your next job—you'll find we're right when we say "you'll always be glad you bought a Buckeye."



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Cost of back-filling going down when a Buckeye Back-Filler hustles the dirt back where it came from. Here's a one-man machine that one man can run. Turns in its own length. Boom has 160 degree swinging range. Full length multiplane traction and plenty of power. Complete details in the Back-Filler Booklet. Shall we shoot you a copy—today?

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* * *

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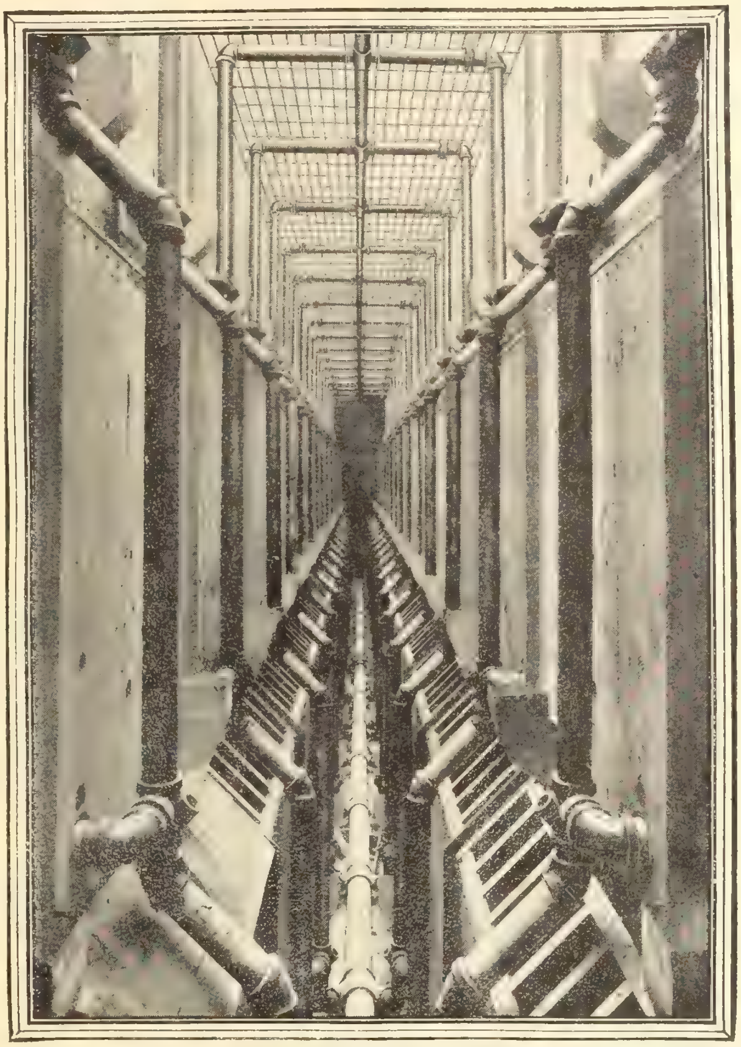
The accompanying cut illustrates this point clearly. Note the number of fittings and joints and the perfect alignment of all piping.

Crane plumbing and heating equipment is built in types and sizes to meet any requirement, and when properly installed will insure long life under the most severe conditions.



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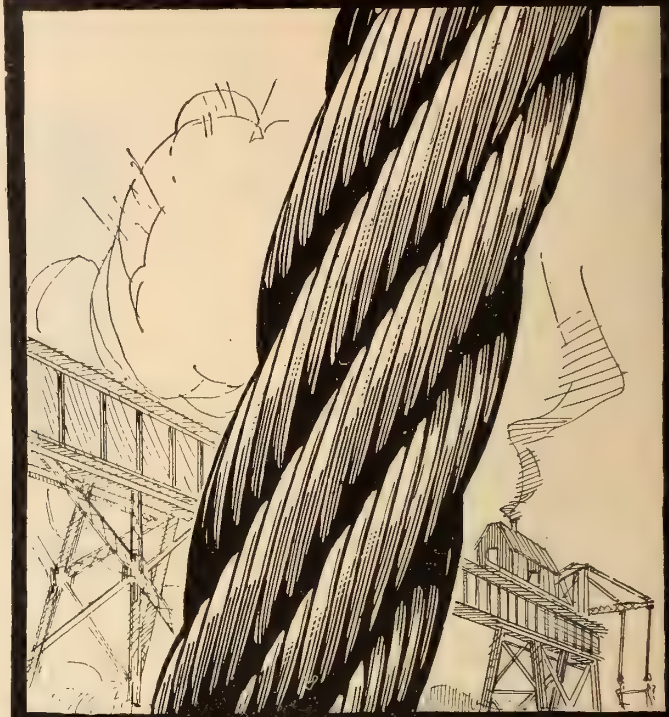

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Strength

The finest materials and careful workmanship that go into Greening's Wire Rope are the source of its unusual strength. Quality has been Greening motto for sixty years.

Adaptability

The B. Greening Wire Company have kept accurate record of all conditions under which their rope has been used. This data is available to users of wire rope without obligation and frequently saves them time and money.

Write for complete catalog

The B. Greening Wire Co., Limited
Hamilton, Ontario
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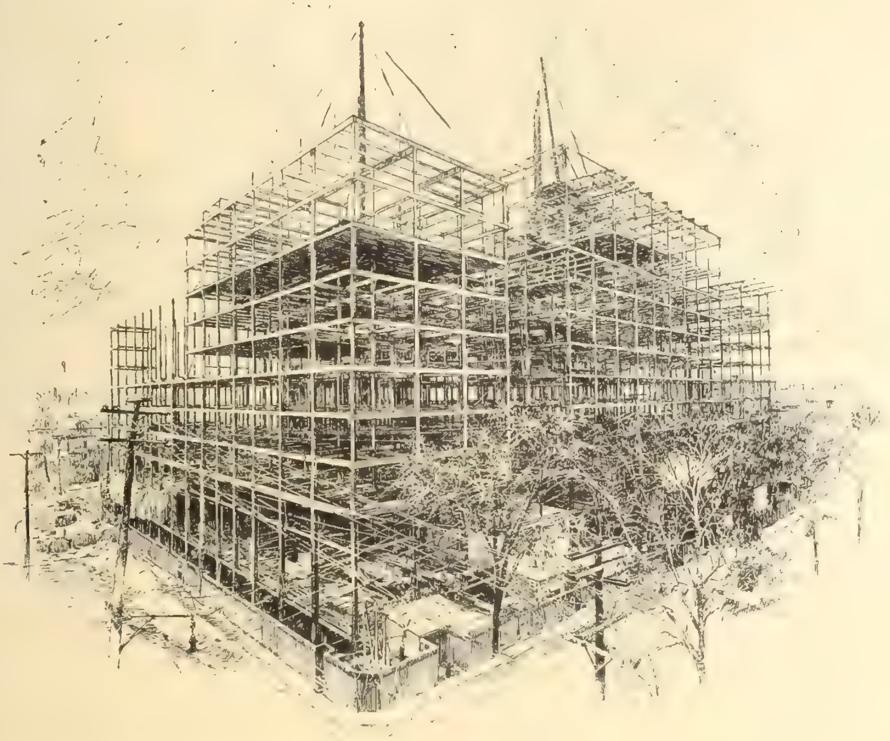
If Winter Comes

as Winter always does



STRUCTURAL STEEL

is particularly well adapted for construction work, in avoiding the usual interrupted progress of erection when the time schedule runs into the Winter Months.

Winter construction with STRUCTURAL STEEL is profitable, from the economy, due to the increased supply and efficiency of labor during the cold weather months.

It will pay you to prepare your building plans for construction next winter with STRUCTURAL STEEL.

BUILD WITH

STRUCTURAL STEEL

Issued by the
Structural Steel Association

Power House, Point du Bois—view from tail-race

Harnessing the Waters of the Winnipeg River

CANADA CEMENT CONCRETE FOR PERMANENCE

The development of water power within economic transportation distance of Winnipeg, has reached a point where 70,000 horse power is available, and there is sufficient additional reserve power to develop 500,000 H.P. when required.

At the power house site, the Winnipeg River falls over a series of rapids with a natural fall of 33 to 28 feet within a ¼ mile. This fall is increased to a total head of 43 to 48 feet, by a concrete Dam; giving a pondage area of 7 sq. miles. The Power House, completed in 1920-21, is of concrete and steel. The Power House foundations consisting, besides the series of draft tubes, of a series of flat tail-race arches upon supporting walls tapered in plan, were built in pairs of arches; the two adjacent spans, built as a unit with a mid-wall, are resting upon asphalt painted skewbacks formed upon alternate tail-race walls. The contraction joints are thus 56 ft. apart. By this means the use of reinforcing steel in these arches was avoided.

In the other elevation of the building the foundations were separated into three portions—the arrester bays, the transformer and generator room and the turbine and rack rooms. This was done by the use of two vertical expansion joints, running the entire length of the building. Above the tail race arches, parting planes, asphalted and keyed with wooden strips, were provided in the main walls, with considerable success in the effort to avoid unsightly cracks.

This great plan of hydro-electric development at Point du Bois has given Winnipeg power at the lowest rate on the Continent; less than a half cent per Kw.H.

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Uniformly Reliable

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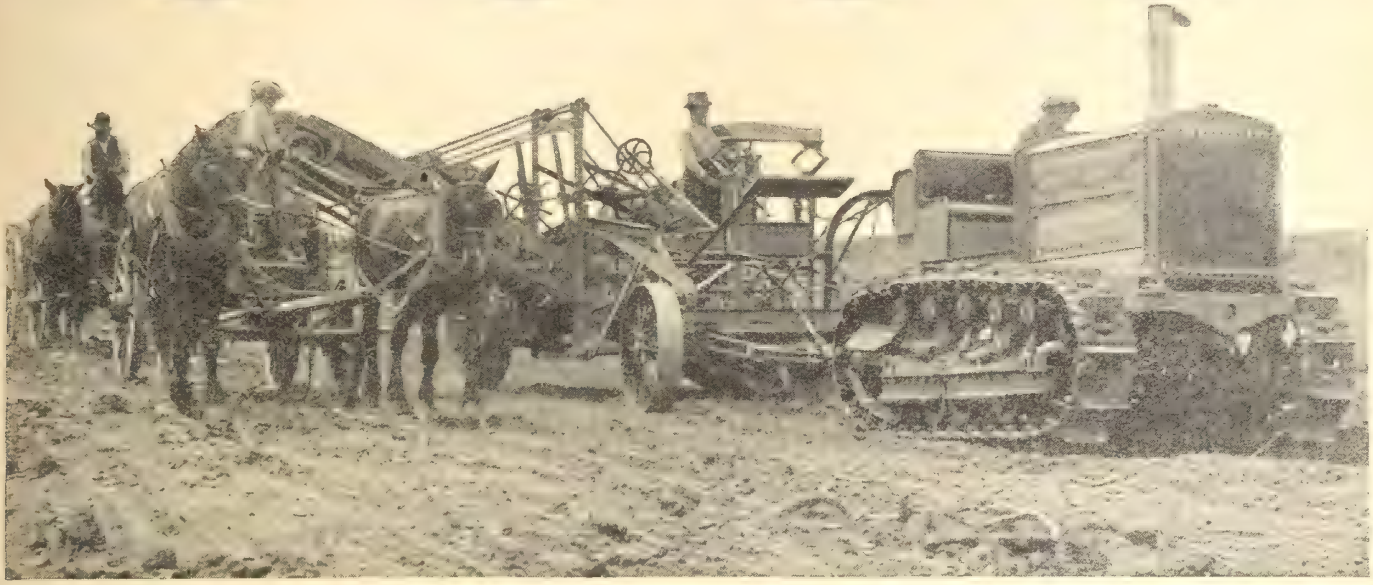

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Severe operating conditions emphasize the difference between the "Caterpillar"* Tractor and every other machine or method. "Caterpillar" performance, dependability, economy and service are endorsed by leading contractors and engineers in Canada as well as throughout the World.

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The "Caterpillar" excels in every field where power and endurance are demanded: logging, mining, freighting, snow removal and public works of every kind.

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"Hand Book of Hydraulics," by Horace Williams King. 1st edition published by McGraw-Hill Book Co., Inc. 424 pages. Price $3.50.

"Handbook of Building Construction," by George A. Hool and Nathan C. Johnson. Two volumes, (not sold separately,) 1474 pages, illustrated. Published in 1920 by McGraw-Hill Book Co., Inc. Price $12.00.

"Operation and Maintenance of Irrigation Systems," by S. T. Harding. First edition, published in 1917 by the McGraw-Hill Book Co., Inc. 271 pages, illustrated. Price $2.50.

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"Sheet-Metal Pattern Drafting and Shop Problems," by James S. Daugherty. Published in 1922 by The Manual Arts Press, 173 pages, illustrated. Price $2.50.

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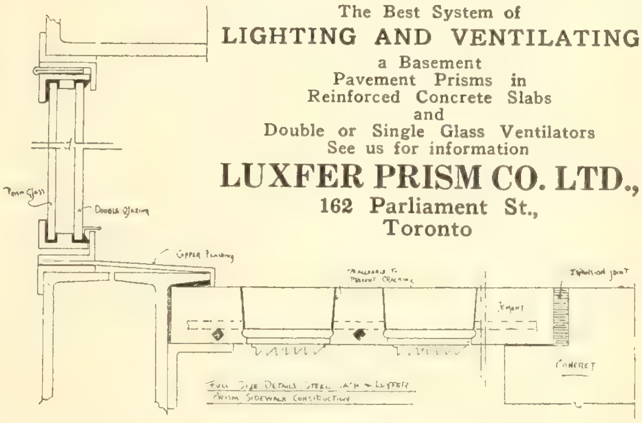
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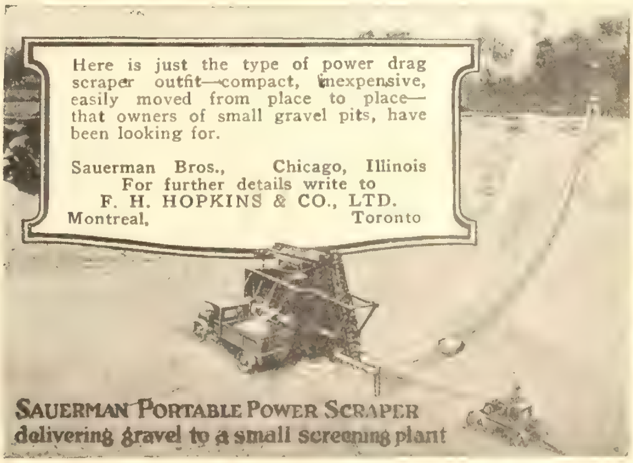

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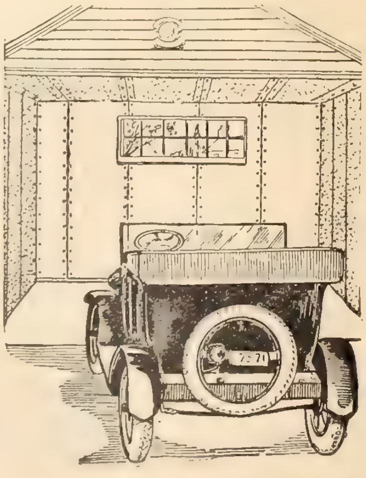

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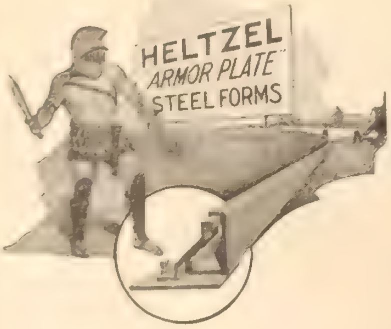

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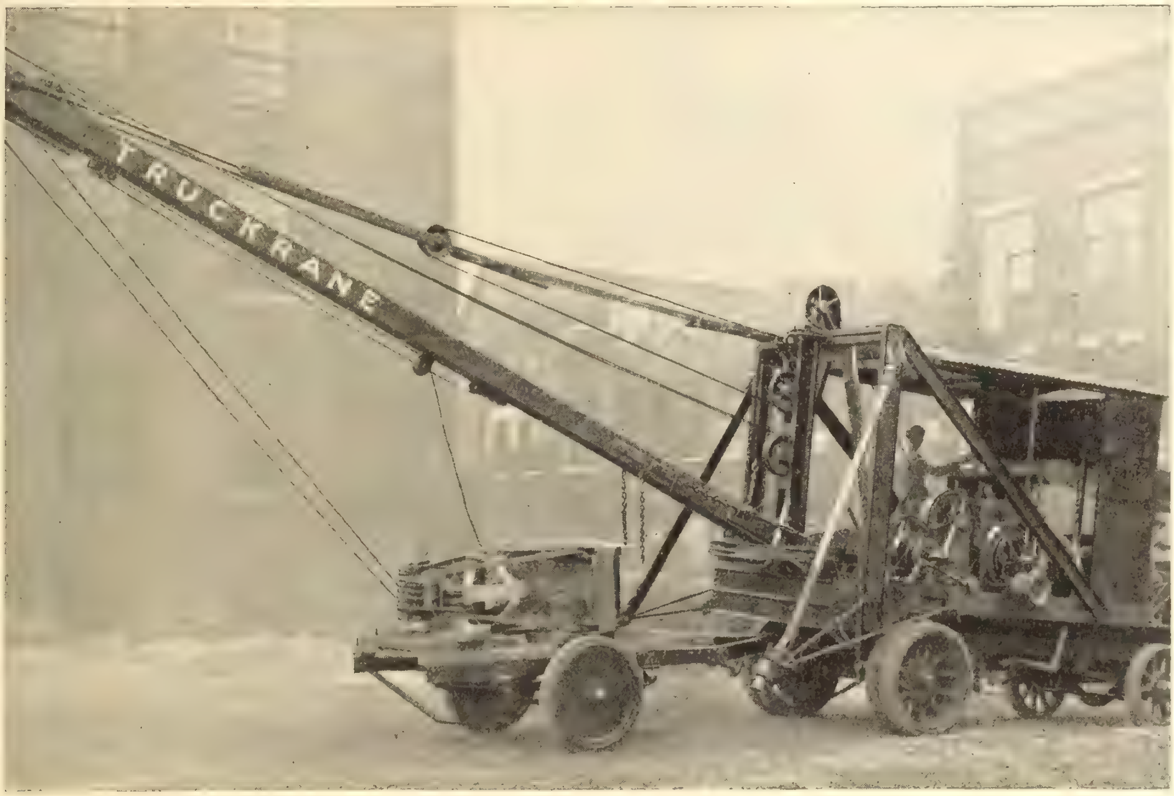

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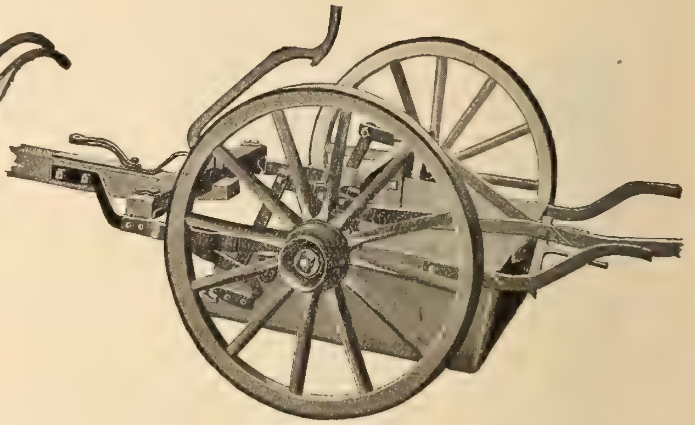

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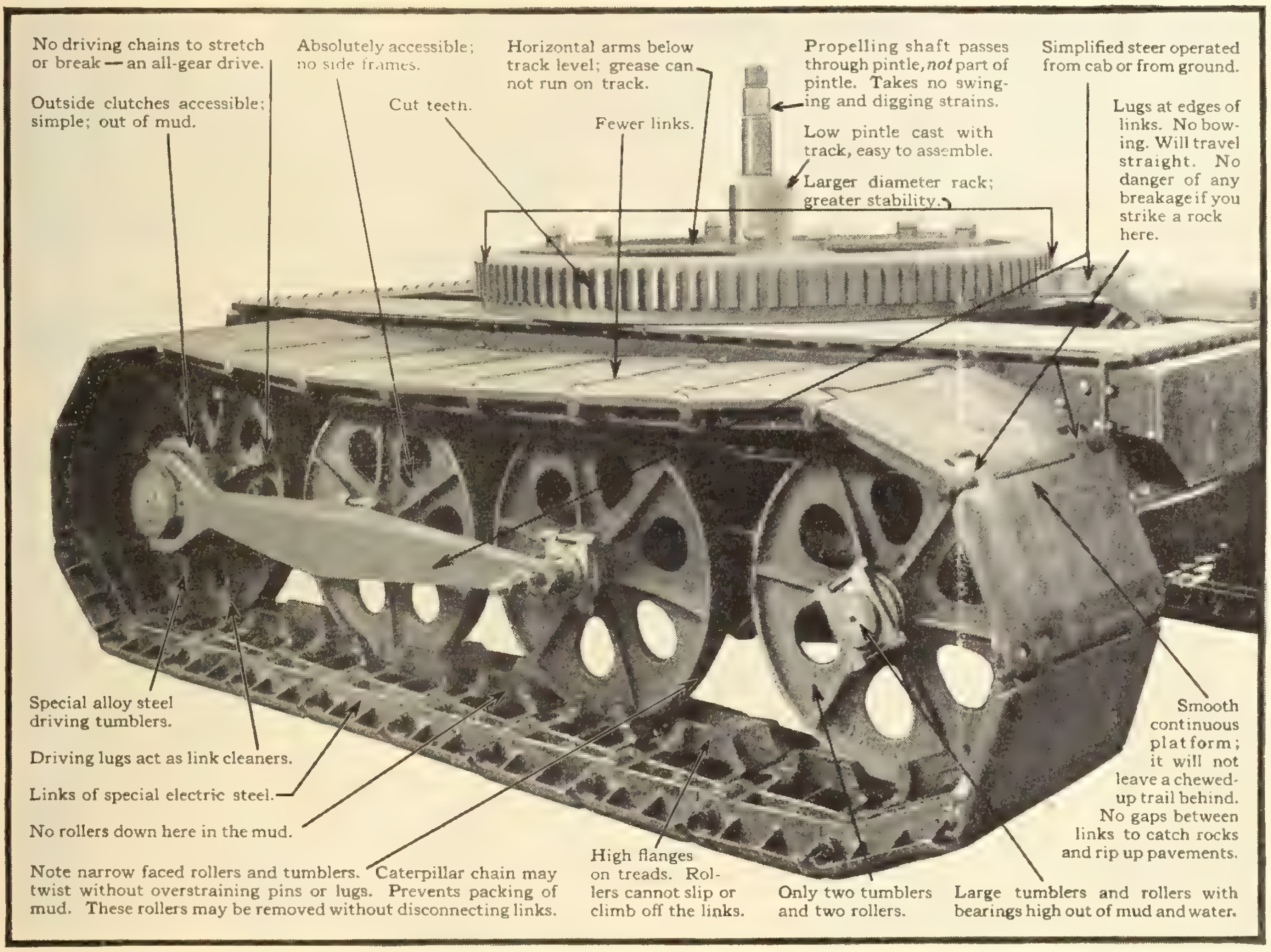

No driving chains to stretch or break — an all-gear drive.

Outside clutches accessible; simple; out of mud.

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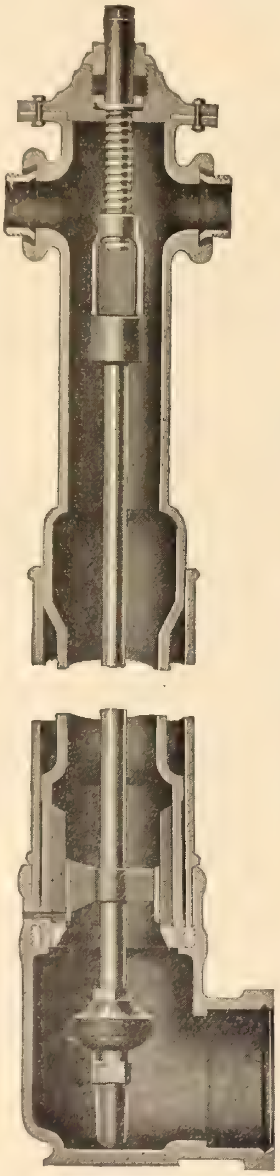

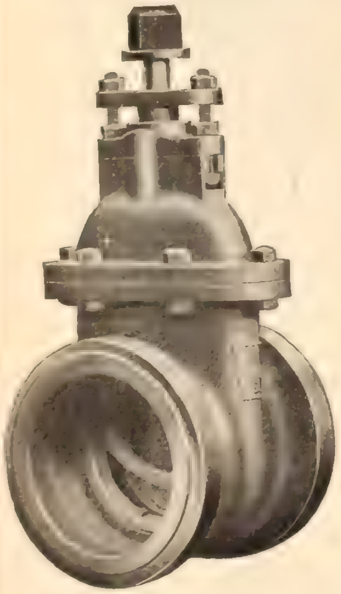

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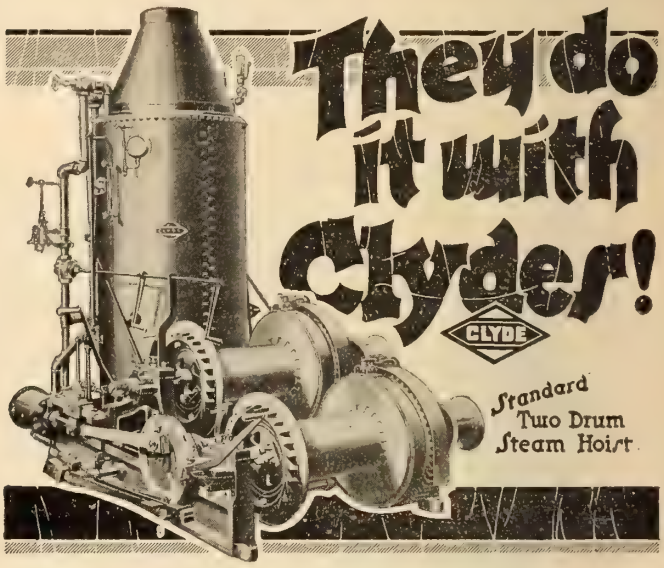
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Vol. 37 Toronto, July 11, 1923 No. 27

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Compressed Air in Contracting

Compressed air has become, in recent years, one of the most valuable agents which the contractor uses in his operations. For variety of uses under diversity of conditions no other source of power quite comes up to it. In fact, it is doubtful if even steam, as important and mighty a force as it is, can offer the contractor the same features of real service as can compressed air. The story of the adaptation of this mighty power to everyday practical needs reads like a romance but great as have been the advances that have been made in the science of using air under pressure, the end is not yet in sight. As a result of persistent investigations in the laboratory and practical experience in the field, compressed air is constantly being put to greater uses, which means new tools and machines or improvements to existing equipment.

As a real labor saver, compressed air has a record hard to beat. Take rivetting, for example. So obvious is the merit of the pneumatic hammer in this case that no figures are required to demonstrate the unquestionable superiority of the air process over hand methods. But the same is true of other operations that may be carried out through the agency of compressed air—excavating, drilling, tamping, caulking, pavement breaking—in each of which pneumatic machinery is capable of showing savings that make hand methods a relic of bygone days. In certain spheres, of course, there is no real substitute for compressed air. Thus it has been the sole means of making possible excavations in water laden soils. While this practice has brought its hazards, it has enabled a class of construction to be carried out that would not otherwise be possible—at least at a cost within reasonable proportions.

Compressed air has thus played a big part in the development of the construction industry. For that reason the series of articles in the Contract Record, dealing with the uses of compressed air in contracting is an important contribution to the literature on the subject. The text and illustrations are very suggestive and will undoubtedly appeal to those contractors who use compressed air with more or less frequency. We, therefore, bring these articles to our readers' notice that they may become acquainted with the latest developments in the art of using pneumatic machinery.

No Pause in Growth of Canadian Building

One of the most encouraging features in Canadian building statistics for the first half of 1923 is the steady expansion which has occurred, month by month, in the value of work performed. Starting with the small total of $9,840,800 in contracts awarded during January, the figures compiled by MacLean Building Reports, Limited, show a swiftly rising tide which culminates in the record for June, the latest month under review. The progress of the industry may be set forth as follows: January, $9,840,800; February, $13,311,800; March, $19,954,800; April, $30,843,800; May, $40,697,200; June, $50,674,800.

Analysing the above figures on the basis of locality, it appears that Ontario leads conspicuously, acounting as it does for more than 49 per cent. of the $165,323,200 half-yearly Dominion total as follows: Ontario, $84,020,600; Quebec, $53,032,600; British Columbia, $10,582,600; Manitoba, $5,842,500; Alberta, $4,851,100; Saskatchewan, $2,453,400; Nova Scotia, $2,276,000; New Brunswick, $1,925,900; Prince Edward Island, $338,500.

Dissecting the Dominion half-yearly figures once more, this time from the viewpoint of the type of work undertaken, the forecasts made earlier in the year that 1923 would continue to be a year of exceedingly active home building, are fully borne out. There has also been a marked increase in industrial building as the following totals for six months reveal: Residential, $50,293,200, or 30.4%; business, $47,426,-

300, or 28.7%; industrial, $20,044,100, or 12.2%; public works and utilities, $47,559,500, or 28.7%.

The price of building materials strengthened as spring advanced, but this seasonal movement seems to have abated. Last month prices receded somewhat and have probably passed the peak for the present time. There is plenty of mortgage money available and also a fairly substantial supply of building funds. Labor costs remain practically unchanged. A continuance of good business throughout the remainder of 1923 seems very probable. Underlying conditions are sound and the outlook is promising.

During June construction contracts awarded in Canada amounted to $50,674,800, compared with $35,620,400 a year ago. Residential building accounted for 24.5% of the June total, and amounted to $12,191,400. Business building amounted to $12,758,000, or 25.0%; industrial building, $6,347,300, or 12.5%; public works and utilities, $19,378,100, or 38.0%. The value of contemplated new work reported during May was $55,936,300.

Good Market in India for Asbestos Roofing

There is in India at present a considerable demand on the part of the railways and public works departments for asbestos roofing of good quality. Ordinary corrugated iron sheetings are inclined to perish quickly in that climate, and it is the experience of the railways that asbestos roofing is the only material upon which reliance can be placed, particularly for engine sheds.

Trade Commissioner H. A. Chisholm reports that while some Belgian and German sheeting has been entering India recently the bulk of the supplies is from the United Kingdom. The Continental product has been found to be inferior in quality to British, and several recent shipments from the Continent suffered heavily in breakages. As a result the market at present would look at nothing but British-made roofing. While no official statistics are available regarding the quantities of asbestos roofing used in India, it is estimated that imports amount in value to about $200,000 per annum. During the last two years from 80 to 90 per cent of this amount represented British goods, while Belgium and the United States divided about equally the remainder of the business.

Of course the market for asbestos roofing is now greatly restricted by its comparatively high original cost, and black iron is used in many structures for which the railways would prefer asbestos. The following c.i.f., crated and delivered, Calcutta prices were recently quoted by a manufacturing concern in England.

Corrugated Asbestos Cement Sheets:
6 ft. by 3 ft. by 3/16 in. at 2s. 3d. per sq. yd.
6 ft. by 3 ft. by 5/32 in. at 2s. 1d. per sq. yd.
3 ft. to 10 ft. by 30 in. by ¼ in. at 5s. 5d. per sq. yd.
Asbestos Cement Flat Building Sheets:
4 ft. to 8 ft. by 4 ft. by 3/16 in. at 2s. 7d. per sq. yd.

Any sheeting made of asbestos cement or other asbestos compositions, which will not perish under the severe Indian sun and heavy rains, should be able to compete with the British brands at present in the market, providing that the sheets do not break in transit and that prices are competitive.

The Week's Developments in a Nutshell

As this item is being written, the battle between the U.S. anthracite operators and the miners is just beginning. Its outcome will have far-reaching effects on the building industry. A year ago, the shortage of coal not only prevented the building of homes but tied up, or partly tied up, many industrial buildings. It occupied the minds of the people to the exclusion of important business matters. If a strike should be declared and the conditions of a year ago duplicated, the effect on industries, in general, will be tremendous.

Strikes in various parts of the world have filled the public eye during the past week. The situation in the plants of the British Empire Steel Company, in the Maritime Provinces, is unchanged. The strike of the dock workers in England has already assumed tremendous proportions, the latest reports stating that 40,000 men are out. At various points in the United States demands for higher wages have caused a cessation of industries.

The situation in England is rather unique. The strike is the result of a reduction in pay of one shilling per day, the wage having been 11s 6d. Dockmen in England are thus fighting to maintain a wage that does not seem too large. By comparison mechanics in the United States are striking to increase a wage that is already twice the amount in dollars.

In the building industry in Canada, practically no changes have taken place in prices. The supply of materials in general is just about sufficient to meet the demand. One company has advertised reduced prices on brick, for a temporary period, but we do not think this indicates an over-supply. It is rather a desire to meet the natural slowing up of business during the "dog days" of July and August. There is a continued demand for the lower priced, poorer quality brick, which many professional builders are using these days. The demand for face brick has been small all Spring, and the manufacturers have governed themselves accordingly. The manager of one of the largest brick companies states that while business is a little slow at the moment, owing to the fact that real estate is not moving rapidly, he has every confidence that by September 1, when people return to the cities from their summer vacations, there will be keen competition for bricks and building materials of all kinds.

Steel prices remain the same, which is true of all building materials and accessories, with the exception possibly of paints and oils, which show a slight recession. Turpentine, for example, is down 15 cents.

It may be a good omen that the threatened street car strike in Ottawa has been declared off, the men accepting the company's offer which is virtually a continuance of the former agreement.

Compressed Air in Construction Work

Recent Developments in the Use of Pneumatic Machinery

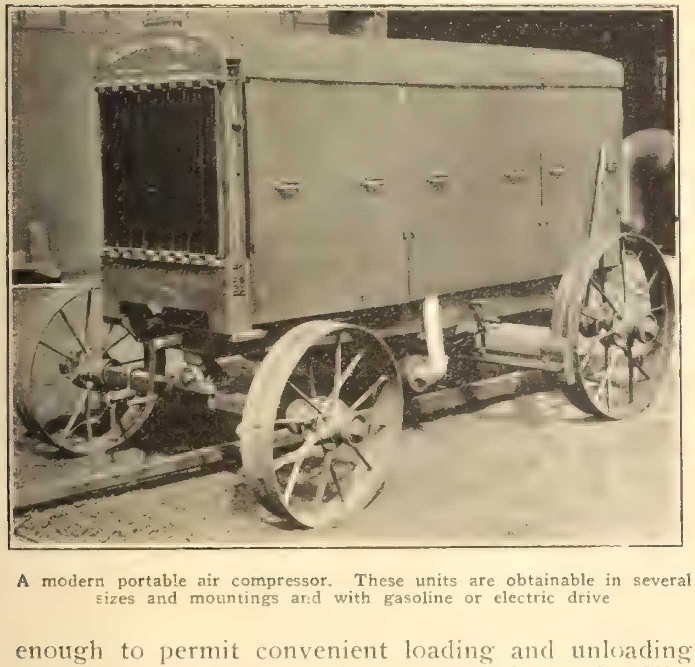
The Second of a Series of Articles Indicating How Compressed Air Can be of Great Service to the Contractor—An Indispensable Agent that Saves Time and Money

By F. A. McLEAN

In road building, and the general run of construction work the source of air power for drilling may be a portable compressor outfit, for it relieves the contractor of the cost, in time and labor, of setting up, tearing down and moving a non-portable unit, also doing away with extended pipe lines, boiler plants and other impediments. A portable rig is in every way to be desired in preference to a stationary outfit.

For true portability the compressor should be of light weight, yet rigidly constructed so that it can be taken over rough country without being damaged. Gasoline motor drive is preferred, because gasoline fuel is available anywhere, and there is no difficulty in obtaining a competent operator, as anyone who is familiar with an automobile can handle the automobile type of engine.

As a single drill power plant it is possible that a skid mounted compressor may sometimes be preferred to a road portable machine. An outfit of this kind is fully self contained, yet light weight and handy enough to permit convenient loading and unloading when being moved on the contractor's truck. The latest development in small portable air compressors is an outfit which is assembled on a Ford truck chassis. Where electric current is available a motor driven compressor may be employed, retaining all the advantages of easy movement with the added convenience of simple electric drive.



A modern portable air compressor. These units are obtainable in several sizes and mountings and with gasoline or electric drive

Where the volume of rock excavation is such that a large number of drills are to be employed, a power producing unit of greater capacity will be needed. When less than 5 large drills are in use it is common practice to utilize a stationary compressor of the single stage, horizontal type, either driven by motor or direct-connected steam engine.

More air can be had and more drill equipment operated from a duplex compressor, again with the choice of either steam or power drive. Such a unit, of course, requires some provision of foundation but there are self-contained, rigid types which one often sees running at full loads when merely bolted to a heavy timber support. This is of decided advantage in a temporary installation, or when intense cold makes concrete foundations undesirable.

A small air-operated drill steel sharpening machine for contractors' use

Importance of a Good Supply of Drill Steels

Second only to the drills and their source of operating power is the matter of choosing and preparing bitted steels which will enable the machines to work at full efficiency. Machine drill sharpening is of such advantage in making perfect bits and shanks, and in resharpening dull steels to the same degree of perfection, that the contractor who is using only three or four drills can profit by installing a drill sharpener. The drill will have plenty of sharp steel and hence work faster. Steels will not stick nor holes be lost and the work at the sharpener will proceed so fast that either a smaller blacksmith force will suffice, or the smith have spare time to devote to other work.

A small sharpener to care for hand hammer drill steel can easily move with the job, while on heavier work it may be preferable to establish a central smithy with a larger sharpening machine and collect and redistribute steel along the job.

Numerous instances are on record of cases where machine drill sharpening has reduced the cost some 6 or 8 cents per bit under the lowest figure which hand sharpening established. As an instance, a New England contractor, employing four Jackhamer drills and hand sharpener steel was losing money. The drillers were in trouble most of the time with stuck steels and rifled holes. It required 18 or 20 steels to bottom six feet.

The installation of a small portable drill steel sharpener made the job a paying proposition, as will be noted from the following table:

Jackhamer drills are often used for breaking up bolders too large to be handled by a steam shovel

	Hand Sharpening	Machine Sharpening
Size drill steel	7/8 hollow hexagon	7/8 hollow hexagon
Diameter starting bit	2-1/4"	2-5/8"
Gauge variation	1/4"	1/16"
Size powder	1-1/4"	1-1/4"
Depth holes	6 ft.	6 ft.
Steels per hole	18-20	3
Blacksmith shifts	2- 8hr.	1-8hr.
Blacksmiths	2	1
Helpers	2	1

To take full advantage of compressed air power on the job the contractor can also often employ to advantage the small drum hoists which have of late come into such prominence to take care of the odd jobs of hoisting, handling and hauling. Many contractors have saved a lot of time and labor by applying one of these hoists to skid timber, hauling cars, handling culvert forms, hoisting brick and stone, operating drag scrapers and the like. They make the work easy for the men.

Quarrying

Allied closely with the actual road construction is the quarrying of stone for foundation sub-surface or surface of the street and highway.

In the drilling and blasting of the rock the methods and equipment employed are much the same as in road excavation, excepting that the work is on a larger scale.

Jackhamers and the larger hammer drills do today all that the tripod drills of yesterday did and in about half the time. In an Eastern quarry ten Jackhamers replaced fifteen tripod drills and cut the cost of drilling by 70%.

In a Western sandstone quarry the superintendent reports that a Jackhamer drill can do more in one hour than their best gang of three men could drill in enght hours. From another quarry comes the report that in day-in-and-day-out quarry service, covering a total of 31 months, two Jackhamers required only a trifling amount of repairs—an insight into the economy of maintenance which characterizes the modern type of drilling machine.

Despite the fact that most quarries get out their rock by operating with the bench method and using hammer drills almost exclusively, there are conditions which make the use of tripod-mounted reciprocating piston drills desirable. Heavy vertical blast holes and correspondingly heavy toe holes, which break the rock by the use of very large centrally placed powder charges, rather than by lighter charges in a round of scattered holes, still require the piston drill.

Whatever the type of drill, a machine sharpener for bitting and resharpening the drill steel is so great an economizer of time and work that it may be well considered indispensable. An hour's work on the part of the blacksmith will resharpen 50 to 75 drill steels, each one correct in form and gauge. The saving in smithy labor alone ranged from 50 to 75% of the cost of hand work, not to mention or estimate the increase in drill efficiency.

The quarry air power plant is, of course, usually permanently installed and consequently a machine of stationary type. Inasmuch as compressed air is of such major importance in quarrying operation and a big factor in operating cost, it behooves the operator not only to choose a machine which, regardless of the dollars and cents of first cost, will produce the requisite air power with the consumption of less power and one which will stand the gaff of day-in-day-out, full load running. Just as it pays to use a high grade auto truck to carry crushed stone, so it pays to install good air power equipment. In both cases the final reckoning shows a profit.

Drilling 20 foot flat holes with a Jackhamer drill. Cradle helps to support drill and long steels

After a quarry gets going there crop up odd jobs of hoisting, hauling and handling which men or mules can do, but which portable air hoists do better. One of the Hudson River trap rock quarries uses one to switch cars and finds that its operating cost is less than half that of the team of horses it replaced. There are a hundred and one odd jobs for a handy device of this kind.

Pneumatic Calking of Lead Wool Joints

Since the advent of lead wool and its general adoption for calking gas pipe joints, etc., pneumatic calking has been rapidly displacing hand calking methods. It has been found that by the use of pneumatic hammers a lead wool joint can be calked in one half the time taken by hand and a much superior joint obtained. The pneumatic calked joint is not only more uniform and tighter, but in many localities it is the only kind which proves satisfactory. In fact in New York City where the conditions affecting pipe lines is very severe due to numerous subways, elevated structures, and heavy street traffic which cause a great deal of vibration, it is the only type of joint which will stand up and stay tight.

It has been demonstrated that a lead wool joint will not only withstand high pressures of gas or water without leakage but also permits greater deflection than formerly possible. Lead wool joints, pneumatically calked, have been found safe when tested to over a thousand pounds per square inch pressure.

Calking large pipe joints with pneumatic calking hammers

The lead wool, which consists of fine strands of refined pig lead, is calked into a joint in the same manner as the yarn or hemp used for many years as backing for all bell and spigot joints. Since it is calked strand by strand the labor cost would ordinarily be higher for the superior lead wool joint than for the cast lead, while the lead wool itself is also more costly. However, less lead is required per joint and pneumatic hammers have reduced the labor cost.

Lead wool can be conveniently used for repairs or for calking in wet trenches or on submerged mains where the use of cast lead would be very difficult, and it is also convenient to use on joints where the bell points downwards.

Pneumatic Versus Hand Calking

The following interesting figures comparing the two methods of calking lead wool joints were received from a large gas company who do all their work with pneumatic hammers.

Calking Lead Wool—Time Per Man

Size of Pipe	Time by Hand	Time-Pneu. Hammer
12 inches	2½ hrs.	1 hr.
16 inches	4½ hrs.	2½ hrs.
18 inches		3 hrs.
20 inches	7 hrs.	4 hrs.
24 inches	11 hrs.	5 hrs.
30 inches	12 hrs.	6 hrs.
36 inches	14 hrs.	7 hrs
48 inches	18 hrs.	8 hrs.

Data collected by companies using air hammers also show the same approximate results, although the time for the job may vary about half as long as hand calking.

Calking Cast Lead Joints

In laying water pipe nearly all companies use the cast lead type of joint. The more progressive companies and water departments now use pneumatic hammers to reduce the cost of calking. They have found that with the cast lead type, pneumatic hammers reduce the time necessary about one half and furthermore produce a much better joint.

Pneumatic calking is also found particularly valuable when it is necessary to tap a main and when sleeve connections are used. The pneumatic hammers are preferred because of the difficulty of getting at the joints when calking by hand.

Pneumatic Versus Hand Method of Calking Cast Lead Joints

The accompanying chart obtained from the water department of a large city, shows graphically the camparative costs of hand calked water main joints and those calked with air hammers.

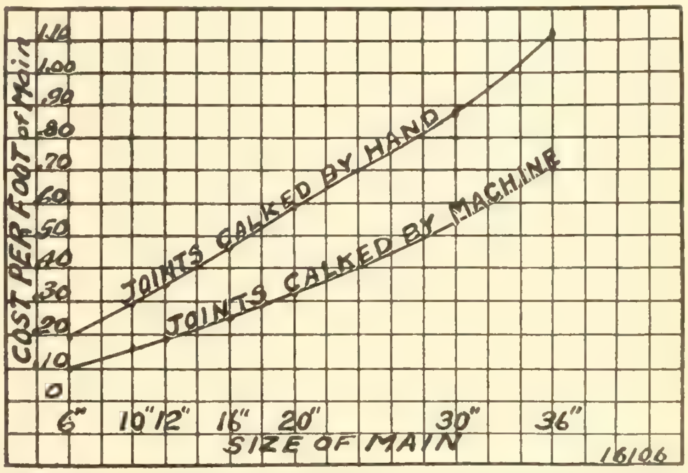


Table showing comparative time required to caulk joints by hand and pneumatic hammers

Backfill Ramming

In addition to calking lead joints by air many contractors have taken up the use of air tools for backfill ramming. The sand rammer type of air tool, long used for ramming sand in foundries has been successfully applied to backfill ramming in trenches.

In tamping backfill, the pneumatic rammer enables a workmen to do ten times the work he can do by hand. An air tamper will strike 600 or more hard, snappy blows a minute, ram the fill hard and work in and around pipe with far greater thoroughness than by hand methods.

Working on city streets, air driven rammers have two big advantages over hand work. First, they do

The speedy blows of the Pneumatic Rammer make it possible to tamp back-fill harder and faster than can be done in any other way.

the work much more quickly and second, they ram the dirt much harder. This makes it possible for the workmen to get the trench properly filled in shorter time and enables them to put more of the dirt back in the hole, so that it is not necessary to carry away as much excess dirt. At the same time, when the pavement is laid there is less danger of settlement. With the pneumatic rammer the workmen can also ram the dirt much harder in the awkward places which would ordinarily be slighted when using hand rammers.

Pneumatic backfill rammers have been extensively adopted by public service companies and contractors because they show notable savings. Two different companies, who are using these tools for all backfill ramming, report as follows:—

Hand Method—100 ft. of Trench

Two rammers and one shovelman, 5½ hours at 90 cents per hour (tools, charges, etc., practically nil)	$4.95
Hauling excess dirt to dump	7.68
	$12.63

Pneumatic Ramming—100 ft. of Trench

Two rammers, five shovelmen, compressor charges, ets., 1-2/3 hours at $1.95 per hour	$3.25
Compressors, depreciation, first cost and repairs to rammers, repairs to compressor, fuel, lubrication, etc.	2.53
TOTAL	$5.78
Saving per 100 feet of trench	$6.85

From the above figures it can be seen that the pneumatic rammers produce a substantial saving in the actual cost of the work, to say nothing of the better work accomplished. The better quality of the work becomes more evident later on with elimination of settlement and any necessity of subsequent refilling of trench to level or repairs to overlying pavement.

The second company is getting the following results with the same tools:

Hand Method—100 ft. of Trench

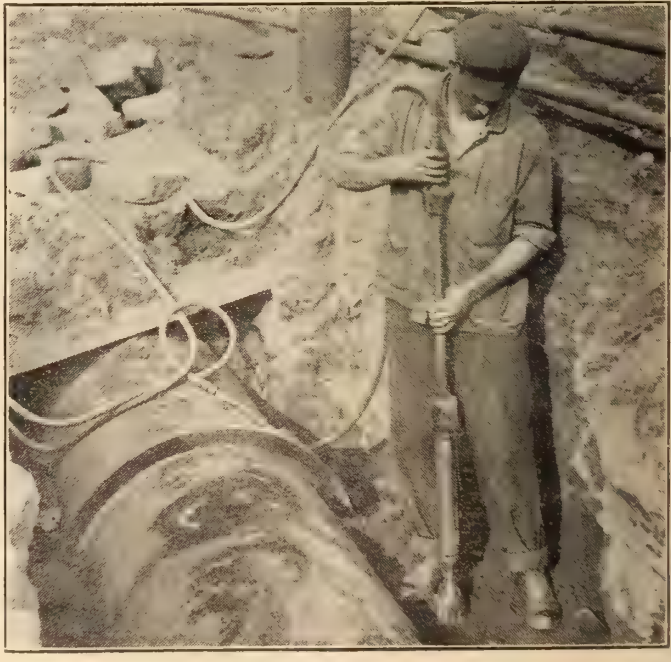
Labor, supervision, rainy day charges, etc.	$17.00

Pneumatic Ramming—100 ft. of Trench

Two rammers, four shovellers, and all compressor charges, etc.	7.20
Saving per 100 ft. of Trench	**$ 9.80**

These last figures show an even greater saving by the pneumatic method, although in this second case the company has evidently a somewhat different system of basing the charges for the backfill tamping. However, these two reports, from companies doing work in widely separated territories, agree on the economy of the pneumatic method.

(To be continued)



Close-up view of a pneumatic Rammer showing type of pein used. A flat pein is also employed for certain conditions

Do Contractors Over-order Cement?

Producers Claim that it is Common Practice for Purchasers to Make Padded Contracts or Place Duplicate Orders—Contractors Assert that an Unsatisfactory Type of Contract Justifies Them in Covering Against Non-Delivery

In order that an architect, a contractor or an engineer may be able to know the exact cost of the cement required for a particular enterprise, it is a trade practice to enter into a contract technically known as a "specific job contract," under the terms of which, the manufacturer agrees to deliver the cement required during the entire construction period of the project at an agreed price. According to the cement manufacturers, this practice involves the manufacturer in a hazard as to manufacturing cost, because during the life of the contract, the factors entering into cost may materially advance. The terms of these contracts, they say, confine deliveries to requirements of the job and are so made in order to minimize speculation in cement to the deteriment of the public.

Several U. S. producers of cement complain about this situation, and as probably conditions in the cement market in Canada are not much different from those in the United States, the gist of the criticism is quoted:

"It is a common practice for purchasers—either through excessive caution or desire to speculate at the manufacturer's expense—to make padded contracts naming amounts much in excess of the requirements of the job and even to place duplicate contracts for the requirements of the same job with several different manufacturers. This is the serious problem. It introduces an element of uncertainty into the manufacturer's knowledge of his exact position. Basing his judgment on specific job contracts booked, he figures the amount of his production which is still available for sale. But if the contract for cement has been placed with several companies, only one may be called upon for delivery which means that the other companies have withdrawn from the market the amount of cement for that job, which, if the duplication of contract had not occurred, would be available for sale.

Producers Claim 40 per Cent Overordering

"In the year 1920, an investigation was conducted for the purpose of determining so far as possible, the average amount of cement over-contracted for on specific jobs. Capable engineers were employed to make the estimates. The investigation showed that 40% of the cement so contracted for, was not required for the jobs.

"Demand for building materials this year has aggrevated the conditions herewith described, and there is no doubt of an outstanding duplication or padding of contracts running into many millions of barrels that will not be called for delivery, which are now necessarily withheld from the market because of these fictitious contracts. If it was possible to eliminate them, this additional amount of cement would be available for sale, and would be a material influence in making the cement market easier.

"Another factor of importance is the peak load condition which occurs during the months when outdoor construction is most active and the demand for cement heaviest. If consumers would realise that spreading their purchases over the months of normally low demand not only would assure an ample supply but also better delivery, it would be a great help to all concerned. Otherwise the manufacturers are called upon to deliver in the peak months of July, August, September and October more cement than is currently produced or can be currently delivered."

Some Overordering Justified by Type of Contract

When these charges were raised the Associated General Contractors of America immediately took steps to investigate the prevalence of overordering, the causes for it and the possibility of finding a permanent remedy. The investigation has been carried far enough to reach certain conclusions which are herewith published as a reply to the principal points relative to construction operations mentioned in the communication of the cement manufacturers:

"These points made either directly or by inference, as we interpret the communication, are as follows:

"First—Construction companies, either through excessive caution or a desire to speculate at the expense of manufacturers, contract for cement, greatly in excess of their requirements—the excess amount as indicated by a number of cases investigated, averaging 40 per cent of the actual needs.

"Second—Cement is sold, presumably against the desire of manufacturers, under a fixed price "specific job contract," which is cancellable by the contractor, but to which the manufacturers submit as a protection to the public against the evils of speculation.

"Third—The demand for cement should be more uniformly spread and overordering or other wasteful and selfish methods in the building industry should be abandoned if the industry is to function properly.

"In reply to these points, the following analysis is offered:

"First Overordering or the duplicating of orders does occur to a very limited extent when construction companies are bound by a completion time limit and penalty, under a contract which grants no extension of time for delay in material delivery, or where such delay introduces excessive costs; but no instance has so far been found where overordering was practiced merely as a means of speculation.

"The volume of cement used by contractors has been estimated by the cement manufacturers at 40 per cent of their output and if all contractors overordered 40 per cent, the excess orders would equal some 16 per cent of the total production. That all contractors do not overorder 40 per cent is obvious. Ten per cent is probably an excessive average, and this amount, in so far as construction companies are concerned, would represent excess orders of about four per cent of the total production.

No Guarantee of Delivery

"Second—Cement is almost universally sold under a loose form of contract, which guarantees the price, but which does not bind the seller to deliver a given quantity of material within a given time. Therefore, since the construction company is almost invariably bound to its client under a time of completion penalty, and also faces an excessive loss from delayed material, it commonly occurs that the time element is a more vital factor than a reasonable variation of price. In other words, the construction company sells short on time, as well as on price and under the existing form of material contract, it cannot cover itself against non-delivery.

"It is important to take cognizance of the fact that on certain types of highly organized construction work, notably highways, which depend upon continuity of material delivery for their success, a delay in material delivery may entail an unavoidable overhead expense of from $30.00 to $50.00 per hour. Such an unproductive expenditure is capable ot ruining almost any construction company and they dare not trifle with the question of delayed material. If the manufacturer and the dealer, who receives a commission on all cement used in his territory, will assume responsibility for delivery at a given time, the practice of overordering or duplicating can doubtless be eliminated. It has birth in the trade practices of cement selling and upon revision of these practices depends its correction. Under existing conditions, it is surprising that the extent of overordering is not greater.

"Since the manufacturer does not agree to deliver at a given time or rate and since the owner demands his project at a given time, the construction company is obliged to accept responsibility for contingencies which neither of these will assume. In the construction of a modern office building, there may be a score of industries who pass this same contingency along to the construction company, and it is almost inevitable therefore, that as long as the present form of material contracts exists, construction companies here and there will overorder as a means of self preservation.

Present Contract is Unsatisfactory

"The present form of contract employed in the purchase of cement and various other material is no instrument of construction companies. In fact, they are repeatedly injured by its use and have sought its abandonment. Construction is salted with such instruments, which in the public interest, as well as in the interest of the industry, should be substituted by a system of bona fide mutual contracts, harmonizing with the major construction agreement.

"Reliable construction companies have often sought to enter a bona fide non-cancellable contract guaranteeing delivery and acceptance, and relieving seller from delays of transportation, but this offer has been declined. In certain instances where the inability to deliver cement was attributed to lack of transportation, and construction companies offered to provide transportation off dock either by water or rail, these companies were found to be oversold and could not deliver. Overselling as well as overordering is an important factor in the expansion period of the construction industry. Any recession of the manufacturers, not only of cement but of other materials, from a stand against the adoption of mutual, non-cancellable sale contracts will unquestionably meet with sincere co-operation from the country's construction companies.

"Third—The cement companies make a sound constructive suggestion that the demand for cement be more uniformly distributed and that all wasteful and selfish practices in the industry be abandoned. To this there is but one answer—a co-operative examination of existing methods, impartial analysis of the economics and ethics involved and a sincere effort on the part of each industry to govern itself with due regard for commercial rights of every other."

Tests on Yellow Pine and Douglas Fir Timbers

Forest Products Laboratory is Investigating the Behavior of Long Columns with a View to Recommending Safe Working Stresses—No Important Difference Between the Two Species.

Tests on 12" by 12" by 24'-0" southern yellow pine and Douglas fir timbers are under way at the U. S. Forests Products Laboratory, Madison, Wisconsin, in co-operation with the National Lumber Manufacturers Association. The purpose of these tests is to study column formulas and laws, to obtain data on the effect of density and defects, such as knots and shakes on columns, and with these data as a basis to recommend safe working stresses for structural columns.

The testing program as outlined covers a four-year period and will include tests on both green and air-dried materials. One-half of the material required was cut during the summer months and the remainder during the winter. The quality ranges in grade from clear and dense to very defective and light weight material.

The timbers required for the four-year period program are divided into four shipments for delivery to the laboratory at approximately six months' intervals. Three of these shipments have already been received and the last is expected soon. The material in each shipment is divided into two matched groups—one to be tested in the green condition and the other to be stored under shelter for two years prior to testing. Tests have been completed on the two shipments of green southern yellow pine and one of Douglas fir. Thus one shipment of green Douglas fir still remains to be tested as well as all the timbers in the air-dry condition. Hence about two and one-half years more will be required before all the tests contemplated will be completed.

Material

Series 1 consisted of 20 timbers, 14 of which were identified as true longleaf pine (Pinus palustris). The other six were not longleaf and were consequently designated as southern yellow pine, not longleaf, as it was impossible to determine their exact botanical species from the wood.

Series 2 consisted of 20 timbers, of which 19 were identified as true longleaf pine. A majority of the timbers in series 1 and 2 were butt cuts.

Series 3 consisted of 20 Douglas fir (Coast type) timbers. This material was selected so as to include representative material from the various types of fir.

Tests

All timbers were first tested as long columns under what may be considered pin-end conditions and then sawed up into short columns and standard minor test specimens. The data given in this summary consists only of that portion obtained on the long column tests.

Prior to each column test, the stiffness of the timber (modulus of elasticity, E) was obtained by testing it as a beam in static bending. The maximum load applied was, however, well within the elastic limit, so as not to injure the material.

The calculated Euler load was obtained by solving the equation:

$$\text{Euler load} = \pi^2 \frac{EI}{L^2}$$

Where I = moment of inertia of the section,
L = length of the column in inches.

The average load carried by the column in series 1 (southern yellow pine) was 293,290 pounds, or approximately 98 per cent of the average calculated Euler load. Seven of the columns, however, carried loads greater than their respective computed loads. Since a column sustaining a load greater than the computed Euler load is in unstable equilibrium, loads in excess of the calculated load have no practical value. Should the excess loads be reduced to their respective Euler loads, the average becomes 285,500 pounds or approximately 96 per cent of the Euler load. The greatest load sustained was 432,600 pounds and the least 201,500 pounds. Both of these columns were true longleaf pine (Pinus palustris). The average specific gravity of the former (based on oven-dry weight and volume at test) was approximately 0.54 and that of the latter 0.40.

Summary on 12 by 12 inch by 24 foot timbers in the green condition—pin-end connections.

Species	Load sustained by columns			Modulus of elasticity		
	Maximum	Minimum	Average	Max.	Min.	(Aver.
		Pounds			1000 pounds per sq. in.	
Series 1						
Southern yellow pine 20 tests	367,500	201,500	285,500	1,872	1,035	1,473
Series 2						
Southern yellow pine, 20 tests	418,400	187,900	308,000	2,190	897	1,522
Average 40 tests			296,750			
Series 3						
Douglas fir, 20 tests	406,300	149,800	292,650	1,788	870	1,500
Do 19 tests	406,300	182,000	300,000			

*Euler load—test load=432,600 pounds.

The average load carried by the columns in series 2 (southern yellow pine) was 316,670 pounds, or approximately 98 per cent of the average calculated load. Seven of the columns in this series carried loads in excess of the Euler load. If these test loads are reduced to their respective Euler load, the average would then become 308,000 pounds, or approximately 96 per cent of the Euler load. The greatest load was 418,400 pounds and the least 187,900 pounds, both timbers being true longleaf pine. The average specific gravity for these two timbers was 0.57 and 0.51, respectively.

The average load carried by the columns in series 3 (Douglas fir) was 299,400 pounds. Eight of these columns carried loads greater than their calculated loads. If the test loads for these columns are reduced to their respective Euler loads, then the average would be 292,650 pounds, or approximately 95 per cent of the calculated load. The greatest load carried by any one in this series was 406,300 pounds and the minimum 149,800 pounds. Average specific gravity for these two timbers was 0.47 and 0.41 respectively. The Douglas fir timber which carried the minimum load failed at a load approximately 50,000 pounds under its calculated value. An examination after test showed that the wood fiber within the failure had a decided water stain showing that the failure had occurred in the log but had escaped observation. Failures of this kind are not uncommon in fir and pine, and other species as well. Should the column strength be based on 19 tests with this erratic value excluded the average would then be 300,000 pounds and the minimum 182,000 pounds.

Knots do not Affect Strength

The clear straight-grain 2 by 2 inch columns cut from the large timbers gave unit compressive strength values and stiffness values slightly higher than the large columns for the same slenderness ratio. Both sies of columns, however, gave load values proportional to their respective stiffness. These tests, therefore, showed that knots in themselves have little influences on the stiffness and consequently do not greatly affect the column strength. However, the presence of a number of large knots in a timber, would indicate that it came from the upper portion of the tree, which normally would have a lower density and lower modulus of elasticity.

The tests in general show that there is little, if any difference in the long-column strength of the two species, since the average load sustained by the Douglas fir specimens based on either 19 or 20 tests, fell between the respective average values for series 1 and 2 of southern yellow pine.

No comparison can be made at this time with the data from the intermediate and 2-foot columns, since knots have a considerable influence on the compressive strength of wood and the material in the three groups has not been analyzed.

A more complete report on these tests will be made as soon as the next series of green Douglas fir column tests have been completed and all data computed and analyzed.

Big Addition to Plant

The Canadian Westinghouse Company has let the contract for the construction of a $200,000 unit addition to its plant in the west end of the city to W. H. Yates Construction Company. This is the first of a series of buildings that will run into a total value of $1,500,000.

Construction Developments During the Month of June

Figures Compiled by MacLean Building Reports, Ltd., Show Trend of Building Activities for Last Month—Details of Contracts Awarded in Eastern and Western Canada

Construction Contracts Awarded in Western Canada, June, 1923

	British Columbia		Alberta		Saskatchewan		Manitoba		Western Total	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	3	$ 105,000	....	$...........	....	$...........	1	$ 30,000	4	$ 135,000
Churches	1	3,000	3	25,400	3	12,700	1	8.000	8	49,100
Factories	2	27,300	2	65,000	....	....	2	9,000	6	101,300
Garages, Public	5	38,500	....	....	....	....	1	15,000	6	53,500
Hospitals	....	....	....	....	....	....	2	22,000	2	22,000
Hotels and Clubs	1	28,000	1	2,000	....	....	1	8,000	3	38,000
Office Buildings	3	15,100	1	1,200	1	1,000	3	12,600	8	29,900
Public Buildings	1	2,900	1	10,000	2	5,000	1	4,000	5	21,900
Residences	99	415,700	41	123,300	65	228,800	138	488,400	343	1,256,200
Schools	5	237,900	2	3,800	14	236,000	4	44,200	25	521,900
Stores	13	67,800	5	27,400	7	22,900	6	25,500	31	143,600
Theatres	....	....	1	20,000	....	....	1	3,800	2	23,800
Warehouses	2	12,000	....	....	4	36,000	2	30,000	8	78,000
Total Buildings	135	$ 953,200	57	$ 278,100	96	$ 542,400	163	$700,500	451	$2,474,200
Bridges	1	13,000	....	....	4	25,900	....	....	5	38,900
Sewers and Waterma	4	98,100	....	....	5	56,500	2	16,800	11	171,400
Roads and Streets	26	623,500	....	....	21	202,100	14	127,200	61	952,800
General Engineering	2	239,800	1	3,500,000	1	15,000	....	....	4	3,754,800
Grand Total	168	$1,927,600	58	$3,778,100	127	$841,900	179	$844,500	532	$7,392,100

Construction Contracts Awarded in Eastern Canada, June, 1923

	Ontario		Quebec		New Brunswick		Nova Scotia		Eastern Total	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	5	$ 90,000	6	$ 205,000	....	$...........	..	$...........	11	$ 295,000
Churches	12	277,000	7	679,000	2	100,000	1	5,500	22	1,061,500
Factories	17	1,525,500	9	4,613,000	1	100,000	1	7,500	28	6,246,000
Garages, Public	13	239,000	7	98,500	....	....	....	....	20	337,500
Hospitals	6	806,800	....	....	....	....	....	....	6	806,800
Hotels and Clubs	8	214,500	3	323,500	....	....	2	353,500	13	891,500
Office Buildings	9	291,000	5	3,340,000	1	15,000	1	3,000	16	3,649,000
Public Buildings	9	145,900	....	....	2	47,000	....	....	11	192,900
Residences	1414	6,824,000	657	3,496,000	36	139,700	8	41,000	2117	10,505,200
Schools	28	1,578,600	12	1,134,000	1	12,000	2	26,900	43	2,751,500
Stores	15	355,500	23	194,300	2	15,800	....	....	70	565,600
Theatres	3	68,000	....	....	....	....	1	15,000	4	83,000
Warehouses	6	323,500	12	1,108,500	....	....	1	5,000	19	1,437,000
Total Buildings	1575	$12,739,300	741	$15,191,800	45	$ 429,500	17	$457,400	2380	$28,822,500
Bridges	30	205.300	7	98,800	2	43,000	....	....	39	347,100
Dams and Wharves	5	62,000	1	360,000	....	....	....	....	6	422,000
Sewers & Watermains	19	620,700	10	173,500	....	....	....	....	29	794,200
Roads and Streets	85	3,521,400	70	3,265,500	13	484,000	18	370,000	186	7,640,900
General Engineering	15	4,000,000	16	1,148,000	2	108,000	....	....	33	5,256,000
Grand Total	1729	$21,148,700	845	$20,237,600	62	$1,064,500	35	$827,400	2673	$43,282,700

Opinions on the Question of Lumber Lengths

The Abolition of the Old Established Custom of Selling Even Lengths is Favored by Many Manufacturers and Users—Objections Come from the Retailers Largely

In the last issue of the Contract Record reference was made to the investigation that is being conducted as to the desirability of odd and short lumber lengths. It was pointed out that a great many economies would result were the long established custom of manufacturing only even lengths abolished, but it was intimated that some protest would arise from some wholesalers, retailers and consumers, who would not be anxious to add to their cost of handling. The matter is in the hands of the Practical Size Investigating Committee, a subsidiary of the Consulting Committee on Lumber Standards, the membership of which consists of manufacturers, retailers, wholesalers, architects, contractors, railroad representatives, wood-using representatives, and representatives from engineering and technical organizations.

Several persons or firms interested in the subject have expressed opinions and from their letters these extracts are taken:

A manufacturer writes: "We have decided opinions on the subject of odd and short lengths of lumber, as we think it a crime and a sacrilege to trim off perfectly good lumber that is suitable for the purpose for which it is generally used. We have been preaching this, but our talk falls on unsympathetic ears and it is going to take a lot of propaganda to sell the idea to the retailers that are handling lumber and who meet the consumer."

Another manufacturer writes: "The strict limitation of quantity of short lengths and the refusal of the trade to accept odd lengths seems unwarranted and altogether unnecessary and is simply another one of the many grooves we get in and continue in without good reason. This practice undoubtedly is contributing to higher manufacturing costs as there is a big discrimination in price against short lengths and odd lengths are scarcely made at all. This means millions of waste at the mills of the country. The practice should be abolished in the interest of elimination of waste of forest products."

Dealers Object

Another view on the subject is as follows: "As a conservation measure the Forest Service is, of course, greatly in favor of the more extensive production and use of odd and short lengths lumber of all kinds. In fact, several years ago it made preliminary studies of this problem.

"From a broad view of the question it is apparent that lumber manufacturers are naturally interested in the inclusion of more odd and short length lumber in all shipments, and it seems, therefore, that extensive work among that group of the industry is hardly necessary to a successful solution of the problem. On the other hand, the groups which object to odd lengths and more short length lumber included in each shipment are the dealers, both wholesale and retail, and to a considerable extent, the larger consumers. The reasons usually advanced by these classes of the industry against a practice of this kind is the increased cost of handling, increased storage space necessary, increased capital, and overhead necessary to carry a representative line of lumber, and a decreased turnover of stock. Possibly other reasons are advanced, but it seems these are the more important ones. Thus to get at the heart of this question it appears that any investigation sould be aimed at conditions within these groups of the industry.

"It would be well to study the existing conditions in the wholesale, retail, and consuming trades and endeavor to obtain facts to substantiate the claims of hardship on the part of the dealers in handling odd length material and more short pieces. It is very possible that the results of such a study would show that some of the contentions are apparent but not real, and that in the end more of this material could be handled by dealers without undue increased expense, or an increase proportionate to the saving in raw material to be affected.

"This latter factor might require some sort of a study at the manufacturing end to determine just what possible saving could be brought about through the production of odd lengths and more short length stuff."

Consumers Buy Short and Odd Lengths

The whole matter is up to consumers in the opinion of one person who writes thus: "As was stated, in discussion at the Standardization Conference where a serious defect can be removed, by trimming 1-foot, the manufacturer would be glad to conserve the remaining foot if the builder would not insist that dimension be cut in multiples of 2"; the question of how much could be conserved by trimming dimension in multiples of 1" is indeterminable and the question in which the manufacturer is most interested is the lengths that can most economically be utilized, and as this is a question that can only be settled by the builder himself, it is not a question in which the experience of the manufacturer is involved.

"The consumer has been buying and will continue to buy, short lengths and odd lengths in hardwood flooring; they are also buying and will continue to buy short lengths bundled with long lengths in fir, and I see no reason why they should offer objection to any other manufacturers following the same practices as those referred to. When it comes to the question of marketing odd and short lengths, with a differential in price, this is purely a manufacturer's and not an association problem; as you know, the association is not directly interested in prices and it is a question we do not even discuss with our subscribers, but I will say this for your information and for the information of the Practical Size Committee, that if the manufacturer is compelled to make a concession in price on odd and short lengths, the consumer will have to pay the difference when he buys even and regular lengths.

"There is a variable percentage of short lengths produced by all manufacturers, and the price is based on standard lengths, which of course means the allowable percentage of short lengths as provided for in the specifications, and unless the consumer is willing to merge those short lengths together with the longer lengths, his blood must be on his own head."

Segregation of Lengths

"I have very little information of value to offer," writes another manufacturer. "The basic length in Southern Pine is 16 ft. and, I believe, it has proven the one which can be most economically worked to. In my experience in the local market, we sometimes pay more for shorter and sometimes more for longer lengths than for the base.

The present general rule of allowing 5 per cent. of short lengths, for example, in the lowest finishing grades may be advantageous in some cases and in others a decided hardship. The same percentage of short lengths applies to 'B and Better' flooring with increments of 5 per cent. of still shorter lengths as the grades become lower. Of course, this allowance refers to mixed shipments of stock-lengths from the manufacturer. The retailer handles the situation of the short length, as it effects price, in accordance with his stock on-hand.

"I believe as good a solution as any would be to separate both short and long lengths from what is usually considered the standard, thus allowing for a plan of a graduated scale of prices. This would necessitate fixing the limits for what would be deemed the standard length, as for example 10 to 16 feet. Lengths greater or less than this would be graduated in multiples of two feet.

"The present Southern Pine standard lengths are multiples of two feet, 4 to 24 feet, for boards, dimension and joists, and multiples of one foot, 4 to 20 feet, for finishing and flooring. I believe a standard variation of less range should be fixed and all other lengths be segregated as suggested."

Retailers Offer the Big Obstacle

"There is no question but what the disposal of odd and sort lengths in the manufacture of lumber is a matter of tremendous importance from a conservation standpoint, and that in many ways large quantities of these items could be used," is another viewpoint. "For a good many years our association has included short and odd lengths in bevelled siding and I believe this practice has become fairly general among several of the regionals. Some time ago one or two of our members started introducing odd lengths in their select lumber and gradually established the use with some of their customers. More recently our association has provided for odd and short lengths in all items of select lumber, allowing a certain percentage of it in any shipment of mixed lengths.

"In our common grades the problem is somewhat different, as most of our common lumber is sold on specified lengths in the even lengths. Where mixed lengths are sold, as in the case of No. 4 and No. 5 boards, a reasonable percentage of short lengths are included, usually about 15 per cent., but in the other items of common the shorts are sold separately and we have never endeavored to include odd lengths in common items.

"Our theory is that the greatest waste comes in the upper grades, as there are many pieces where an extra foot of perfectly clear lumber might be saved if an odd length were shipped and that this extra foot in a 12" piece, for example, may represent considerable actual value in dollars and cents. Personally, however, I do not see that it is possible to establish absolutely uniform practice in this respect, as the uses to which a wood is put, the territory and methods used in marketing it and numerous other problems, such as manufacture, make each wood a separate problem to some extent at least.

"After all the development of the odd lengths and short lengths proposition is in the last analysis a marketing and selling problem rather than one of standardization. On the other hand I think that the Standardization Committee can do much by a practical recognition of the usability of odd lengths in many items and by enlisting the support of the retail trade, where in the past the greatest obstacle toward a wider use of both of these items has usually developed.

"I note that it has been intended to put them in the grading rules, but it seems to me that this is hardly the place or, if it is, that it should be carefully handled. We have never considered such things as a component part of grading rules, but rather matters to be covered by a price list."

A Small Market for Odd Lengths

"I am very much interested," writes another person, "in the matter of short lengths for boards and clear lumber but it would probably be harder to use short lengths for dimension lumber except possibly for remanufacturing purposes.

"As to odd lengths, I think there are certain markets in which a 9 ft. stud would find ready sale, but I would harly know of any other odd length, although I believe someone at the recent Chicago conference spoke of some peculiar width city lot which prevailed somewhere in which 15 ft. would be in order.

"The prevailing lengths in joists in New England are 13, 14, and 15 ft. Where there was a big demand for such odd lengths they could probably be specially trimmed, but where pneumatic trimmers are used with the saws 2 ft. on centers, it is a question whether it would be considered practical to insert saws on odd lengths."

Another understanding is as follows: "My understanding is that the retailers shy at odd and short lengths in finish and common boards, not in dimension.

"However, the problem seems largely one of salesmanship. If the architects will supply the retailers with an authoritative statement that such lengths are satisfactory and some assurance that they wili be included in architects' and builders' bills of material, there will be removed much of the ground on which the retailer builds his fear of the proposed standards. He cannot combat the forest conservation argument. He cannot be expected to overlook the increased number of lengths he may have to record and stack.

"The retailers at Chicago struck me as not likely to have objection to the percentages provided in the grades, but as resisting as long as they could any fixing of one foot as the standard variation in lengths or until price differentials for odd and short lengths were fixed.

"In construction peculiar to railroads odd and short lengths are used. This is known to everyone in the lumber industry. I can suggest no line of investigation that would be useful. Retailers rarely supply any of this material. Railroad buildings can utilize whatever architects in general employ."

A Matter of Special Contract

"Specifically, the argument between the producers on the one hand who want to have a regular and standard outlet for their short and odd lengths, and the retail trade on the other hand which, as a whole, does not look with favor upon odd lengths, although apparently generally satisfied with short even lengths in certain proportions, is that the producers want to be put in a position wherein they can ship a certain proportion of short or odd lengths as a part of the standard grade of the various lumber items, whereas the retailers want the inclusion of short and odd lengths, particularly of odd lengths, to be a matter of special contract just as it is today.

"The primary question, therefore, is as to whether the standard grades of lumber items as written and published in the rule book shall provide that certain proportions of short and odd lengths may be included (unless the contract specifically calls for their exclusion) or whether in the standard grades odd and short lengths shall not be permitted (unless the contract specially provides therefor).

"There can be no question of the waste prevention feature of this proposal. I think a lot of persons will agree to standard provisions regarding the inclusion of short even lengths who will not agree to the inclusion of odd lengths. In many parts of New England, for instance, the short odd lengths are more popular and saleable than the long even lengths. In the Adirondacks, for instance, 13 foot studs are the standard and most popular length. Too long for one floor and too short for two but based on the long time custom that has not yet been thrown off. In clap boards also they prefer short lengths to the long lengths and will kick as strongly on lengths over 10 feet as the trade in the Middle West will kick on lengths under 10 feet."

Giving the Owner Better Service

A Clearer Conception of the Duties of the Designer and the Constructor Prevents Confusion and Controversies over their Respective Functions and Makes for Efficient Construction

The performance of construction under the day labor plan by public officials who underestimate the value of a constructor's managerial function, combined with the tendency of constructors and designers to confuse their own respective functions, has indicated the need for a clean-cut statement of what service each of these agencies should rightfully perform for their clients. Many controversies arising between them, over the encroachment of one upon the other's field are believed to result from lack of a proper conception of what each has to contribute and the necessity for both in our economic scheme. A clear definition of their respective services therefore appears essential, and it is to develop such a definition that the accompanying statement of function has been formulated by the Committee on Methods of the Associated General Contractors.

The Designer	The Constructor
1. Will design complete throughout, including structural design.	Will insure completion of project.
2. Will permit ample time for bidding.	Will make quantity survey of plans.
3. Will open bids in public.	Will submit bids at stated period.
4. Will specify materials freely competitive.	Will bid freely in competition.
5. Will award work at the bid price.	Will base bid on his previous unit costs.
6. Will permit only responsible contractors to bid.	Will submit evidence of responsibility.
7. Will give complete information as to dimensions, quality and design.	Will guarantee cost of the work shown on plans and specifications.
8. Will furnish detail plans without delay.	Will warrant time of delivery of structure.
9. Will approve estimates promptly.	Will develop adequate financial credit.
10. Will allow equipment rental on monthly estimates.	Will supply adequate construction equipment.
11. Will furnish ample details.	Will furnish ample tools.
12. Will fearlessly demand justice from the owner.	Will furnish bond for faithful performance to owner.
13. Will submit Joint Committee form of contract.	Will sign Joint Committee form of contract.
14. Will supervise work with his own force.	Will perform portions of work with his own construction force.
15. Will supply practical supervisors.	Will supply experienced superintendence.
16. Will examine specified patented products for prescribed royalties.	Will protect owner against liens.
17. Will allow insurance premiums as part of actual costs.	Will insure owner against all accidents.
18. Will let general contractor award all sub-contracts.	Will be fair to sub-contractors.
19. Will make specifications clear for all divisions of work.	Will be always fair to labor.
20. Will arrange for inspection of materials at source.	Will keep quality standards high.
21. Will not urge continuance of work in case of strikes or lock-outs.	Will guard public interest in labor rates and conditions of employment.

22. Will assist the local chapter of architects.	Will co-operate through local chapter of contractors.
23. Will be resourceful in design of structures.	Will display skill in construction methods.
24. Will reward square dealing.	Will through integrity inspire business confidence.
25. Will respect loyalty of contractors.	Will be loyal to designers.
26. Will encourage young workmen.	Will help train apprentices.
27. Will assume responsibility for errors in design.	Will assume responsibility for errors in construction.
28. Will permit arbitration as to dollars.	Will develop sound commercial practices.
29. Will charge the scheduled designing fees.	Will charge legitimate construction fees.
30. Will pat constructor on the back upon completion of the job.	Will shake hands with designer upon receipt of final estimate.

then

the DESIGNER would not have time nor the experienced business organiation to efficiently undertake construction work.	the CONSTRUCTOR would not have time nor the trained professional technique to adequately design work

and

The Owner

would get the best possible construction service
from Both.

Structural Steel Practice is Defined

Specification Covering Design, Fabrication and Erection Has Been Prepared and Approved by the American Institute of Steel Construction

The technical committee of the American Institute of Steel Construction has prepared and approved a specification for the design, fabrication and erection of structural steel for buildings. The committee consisted of Geo. F. Swain, past president of the American Society of Civil Engineers, professor of engineering, Harvard University; M. S. Ketchum, dean of the College of Engineering, University of Illinois; E. R. Graham, president of Graham, Anderson, Probst & White, Chicago, Ill.; W. J. Watson, president, Watson Engineering Co., Cleveland, O.; W. J. Thomas, chief engineer, Geo. B. Post & Sons, New York.

The specification is as follows:

1. This specification defines the practice adopted by the American Institute of Steel Construction for the design, fabrication, and erection of structural steel for buildings.

2. General

To obtain a satisfactory structure, the following major requirements must be fulfilled:

(a) The material used must be suitable, of uniform quality, and without defects affecting the strength or service of the structure.

(b) Proper loads and conditions must be assumed in the design.

(c) The unit stresses must be suitable for the material used.

(d) The workmanship must be good, so that defects or injuries are not produced in the manufacture.

(e) The computations and design must be properly made, so that the unit stresses specified shall not be exceeded, and the structure and its details shall possess the requisite strength and rigidity.

3. Material

(a) Structural steel shall conform to the Standard Specifications of the American Society for Testing Materials for Structural Steel for Bridges, Serial Designation A 7-21 as amended to date.

(b) The conditions of this specification shall not apply to the use of material salvaged from previous construction which should not be used except under most rigid special inspection and supervision.

4. Loading

(a) Steel structures shall be designed to sustain the dead weight imposed upon them, including the weight of the steel frame itself, and in addition, the maximum live load as specified in each particular case. Temporary stresses caused by erection shall be provided for.

(b) In cases where live loads have the effect of producing impact or vibration, a proper percentage shall be added to the static live load stresses to provide for such influences, so that the total stress found in any member is an equivalent static stress.

(c) Proper provision shall be made to transmit the reactions from steel construction to the foundations of the structures. Steel beams, girders, and trusses having end reactions of 40,000 lb. or over shall be supported on steel columns carried to the foundation.

5. Wind Pressure

The wind pressure shall be assumed as acting horizontally in any direction, according to either of the two following cases, whichever may give the maximum stresses:

First: On the completed structure; at 20 lb. per sq. ft. on the sides and ends of buildings, and on the vertical projections of roofs;

Second: On the frame work considered as an independent structure without walls, partitions or floors; at 30 lb. per sq. ft. of vertical surfaces, and the vertical projection of inclined surfaces of all exposed metal or other members. One surface shall not be assumed to shield another which is directly beyond it in the direction of the wind unless the distance between the two is less than the width of the first. In places where walls or partitions are placed in upper stories while the lower stories are still open, the effect of the wind pressure on such surfaces shall be provided for.

6. Allowable Stresses

All parts of the structure shall be so proportioned that the sum of the maximum static stresses in pounds per sq. in. shall not exceed the following:

Tension: Rolled steel on net section	18,000
Compression: Rolled steel, on short lengths or where lateral deflection is prevented	18,000
On gross section of columns $18,000/(1+l^2/18,000r^2)$ with a maximum of	15,000

In which l is the unsupported length of the column, and r is the least radius of gyration of the section both in inches.

For main compression members, the ratio l/r shall not exceed 120, and for bracing and other secondary members, 200.

Bending: On extreme fibres of rolled shapes, and built up sections, net section, if lateral deflection is prevented	18,000

When the unsupported length l exceeds 15 times the width b of the compression flange, the stress in pounds per sq. in. in the latter shall not exceed $20,000/(1+l^2/2,000b^2)$

The laterally unsupported length of beams and girders shall not exceed 40 times the width b of the compression flange.

On extreme fibres of pins, when the forces are assumed as acting at the center of gravity of the pieces	27,000
Shearing: On pins	13,500
On power driven rivets	13,500
On turned bolts in reamed holes	12,000
On hand driven rivets	10,000
On machine bolts	10,000
On the gross area of the webs of beams and girders, where h, the height between flanges in inches is not more than 30 times t, the thickness of the web in inches	12,000

On the gross area of the webs of beams and girders if the web is not stiffened where h, the height between flanges in inches, is more than 30 times t, the thickness of the web, the maximum shear per square inch, S/A shall not exceed

$$18,000/(1+h^2/1,800t^2)$$

In which S is the total shear, and A is gross area of web in square inch.

Bearing: On pins	27,000
On power driven rivets	27,000
On turned bolts in reamed holes	24,000
On hand driven rivets	20,000
On machine bolts	20,000

Expansion rollers per lineal inch 600 times the diameter of the roller in inches.

Combined stresses: For combined stresses due to wind and other loads, the permissible working stress may be increased 25 per cent, provided the section thus found is not less than that required by the dead and live loads alone.

For members carrying wind stresses only, the permissible working stress may be increased 33 1/3 per cent.

7. Symmetrical Members

Sections shall preferably be symmetrical.

8. Beams and Girders

(a) Beams and girders shall be proportioned by the moments of inertia of their net section, except that plate girders, if not shallow, may be proportioned on the assumption that the flanges are concentrated at their centers of gravity, in which case ⅛ of the gross section of the web, if properly spliced, may be considered as flange section.

(b) Plate girder webs shall have a thickness of not less than 1/160 of the unsupported distance between the flanges.

(c) Web splices shall consist of a plate on each side of the web capable of transmitting the full stress through the splice rivets.

(d) Stiffeners: Stiffeners shall be used on the webs of plate girders and rolled beams at the ends and points of concentrated loads, and at intermediate points where h, the unsupported height between flanges is greater than $42.4\ t\ \sqrt{}\ 18,000\ A/S - 1$. Where stiffeners are required the distance apart shall not exceed in inches $42.4\ t\ \sqrt{}\ 18,000\ A/S - 1$, in which A is gross area of web and S the total shear and t the web thickness. Stiffeners under or over concentrated loads shall be proportioned to distribute such load into the web.

Plate girder stiffeners shall generally be in pairs, on on each side of the web, and shall have a close bearing against the flange angles at points of concentrated loadings; stiffeners over the end bearings shall be on plate fillers. The pitch of rivet in stiffeners shall not xeceed 6 in.

(e) The flange plates of all girders shall be limited in width so as to extend more than 6 in. or more than 12 times the thickness of thinnest plate, beyond the outer row of rivets connecting them to the angles.

(f) Crane runway girders and the supporting framework shall be proportioned to resist the greatest horizontal stresses caused by the operation of the cranes.

(g) Rivets connecting the flanges to the web at points of direct load on the flange shall be proportioned to carry the resultant of the longitudinal and transverse shears.

(h) Rivets connecting the flanges to the webs of plate girders and of columns subjected to bending shall be so spaced as to carry the increment of the flange stress between the rivets.

9. Column Bases

(a) Proper provision shall be made to distribute the column loads on the footings and foundations.

(b) The top surface of all column bases shall be planed for the column bearing.

(c) Column bases shall be set true and level, with full bearing on the masonry, and be properly secured to the footings.

10. Eccentric Loading

Full provision shall be made for stresses caused by eccentric loads.

11. Combined Stresses

(a) Members subject to both direct and bending stresses shall be so proportioned that the greatest combined stresses shall not exceed the allowed limits.

(b) All members subject to stresses of both tension and compression shall be designed to sustain either stress with 5/10 of the smaller added to each.

12. Abutting Joints

Compression members when faced for bearings shall be spliced sufficiently to hold the connecting members accurately in place. Other joints in riveted work, whether in tension or compression, shall be fully spliced.

13. Net Sections

(a) In calculating tension members, the net section shall be used, and in deducting the rivet holes, they shall be taken ⅛ in. greater in diameter than the nominal diameter of the rivets.

(b) Pin connected tension members shalll have the section through the pin holes 25 per cent in excess of the net section of the member, and a net section back of the pin hole equal to 75 per cent of that required through the pin hole.

14. Rivets

(a) In proportioning rivets, the nominal diameter of the rivet shall be used.

(b) Rivets carrying calculated stresses, and whose grip exceeds five diameters, shall have their number increased 1 per cent for each additional 1/10 in. in the rivet grip. Special care shall be used in heating and driving such rivets. Long grip rivets should have the ends sufficiently cooled by quenching to insure the complete upsetting of the rivet shank before the head is formed.

15. Rivet Spacing

(a) The minimum distance between centers of rivet holes shall be three diameters of the rivet; but the distance shall preferably be not less than 3 in. for ⅞ in. rivets, 2½ in. for ¾ in. rivets, 2 in, for ⅝ in. rivets, and 1¾ in. for ½ in. rivets. The maximum pitch in the line of stress of compression members composed of plates and shapes shall not exceed 16 times the thinnest outside plate or shape, nor 20 times the thinnest enclosed plate or shape with a maximum of 12 in., and at right angles to the direction of stress the distance between lines of rivets shall not exceed 40 times the thinnest plate or shape. For angles in built sections with two gage lines, with rivets staggered, the maximum pitch in the line of stress in each gage line shall not exceed 24 times the thinnest plate, with a maximum of 18 in.

(b) In tension members composed of two angles a pitch of 3 ft. 6 in. will be allowed, and in compression members, 2 ft. 0 in., but the ratio 1/r for each angle between rivets shall not be more than ¾ of that for the whole member.

(c) The pitch of rivets at the ends of built compression members shall not exceed four diameters of the rivets for a length equal to 1½ times the maximum width of the member.

(d) The minimum distance from the center of any rivet hole in a sheared edge shall be 1½ in. for ⅞ in. rivets, 1¼ in. for ¾ in. rivets, 1⅛ in. for ⅝ in. rivets, and 1 in. for ½ in. rivets. The maximum distance from any edge shall be 12 times the thickness of the plate, but shall not exceed 6 in.

16. Connections

(a) Connections carrying calculated stresses except for lacing sag bars or angles, hand rails, or beam connections, shall not have less than 2 rivets; or for field connectons, not less than 3 rivets.

(b) Members meeting at a joint shall have their lines of center of gravity meet at a point if practicable; if not any eccentricity shall be provided for.

(c) The rivets at the ends of any member transmitting the stress into that member should have their centers of gravity at the center of gravity of the member, if not, the effect of the resulting eccentricity shall be provided for. Pine may be so placed as to counteract the effect of bending due to dead load.

(d) Where a beam or girder is connected to the web of another beam or girder in such a manner that it develops the effect of a fixed end beam, the resulting bending moment at such connections shall be provided for.

(e) Where stresses are transmitted from one piece to another, through a loose filler, the number of rivets shall be properly increased; tight fitting fillers shall be preferred.

17. Lattice

(a) The open sides of compression members shall be provided with lattice having tie plates at each end and at intermediate points if the lattice is interrupted. Tie plates shall be as near the ends as practicable. In main members carrying calculated stresses the end tie plates shall have a length of not less than the distance between the lines of rivets connecting them to the flanges, and intermediate ones of not less than one-half of this distance. The thickness of tie plate shall not be less than one-fiftieth of the distance between the lines of rivets connecting them to the segments of the members, and the rivet pitch shall not be more than four diameters. Tie plates shall be sufficient in size and number to equalize the stress in the parts of the members.

(b) Lattice bars shall have neatly finished ends. The thickness of lattice bars shall be not less than one-fortieth for single lattice and one-sixtieth for double lattice of the distance between end rivets. Their minimum width shall be as follows:

For 15 in. channels, or built sections with 3½ in. and 4 in. angles—2½ in. (⅞ in. rivets), or 2¼ in. (¾ in. rivets).

For 12 in., 10 in. and 9 in. channels, or built sections with 3 in. angles, 2¼ in. (¾ in. rivets).

For 8 in. and 7 in. channels, or built sections with 2½ in. angles—2 in. (⅝ in. rivets), or 2¼ in. (¾ in. rivets).

For 6 in. and 5 in. channels, or built sections with 2 in. angles—1½ in. (½ in. rivets), or 1¾ in. (⅝ in. rivets).

(c) The inclination of lattice bars to the axis of the members shall generally be not less than 45°; but when the distance between the rivet lines in the flanges is more than 15 in., the lattice shall be double and riveted at the intersection if bars are used, or else shall be made of angles.

(d) Lattice bars shall be so spaced that the ratio 1/r of the flange included between their connections shall be not over ¾ of that of the member as a whole.

18. Expansion

Proper provision shall be made for expansion and contraction.

19. Minimum Thickness

No steel less than 5/16 in. shall be used for exterior construction, nor less than ¼ in. for interior construction, except for linings or fillers, and rolled structural shapes.

These provisions do not apply to light structures such as sky lights, marquees, fire escapes, light one-storey buildings, or light miscellaneous steel work.

For trusses having end reactions of 40,000 lb. or over the gusset plates shall be not less than 3/8 in. thick.

20. Adjustable Members

The initial stress in adjustable members shall be assumed as not less than 5,000 lb.

21. Workmanship

(a) All workmanship shall be equal to the best practice in modern structural shops.

(b) Drifting to enlarge unfair holes shall not be permitted.

(c) The several pieces forming built sections shall be straight and fit close together; and finished members shall be free from twists, bends, or open joints.

(d) Rolled steel sections, except for minor details shall not be heated.

(e) Wherever steel castings are used, they shall be properly annealed.

(f) Punching: Material may be punched 1/16 in. larger than the nominal diameter of rivets, whenever the thickness of the metal is equal to or less than the diameter of the rivets, plus ⅛ in. When the metal is thicker than the diameter of the rivet, plus ⅛ in., the holes shall be drilled, or sub-punched and reamed.

(g) Rivets are to be driven hot, and wherever practicable by power. Rivet heads shall be of hemispherical shape, and uniform size throughout the work for the same size rivet, full, neatly finished, and concentric with the holes. Rivets, after driving, shall be tight, completely filling the holes, and with heads in full contact with the surface.

(h) Compression joints depending upon contact bearing shall have the bearing surfaces truly faced after the members are riveted. All other joints shall be cut or dressed true and straight, especially where exposed to view.

(i) The use of a burning torch is permissible only on material which is not carrying stresses and does not subsequently carry stress through the burned areas.

22. Painting

(a) In riveted work the surfaces coming in contact shall be painted before being assembled, except where encased in concrete.

(b) Parts not in contact, but inaccessible after assembling shall be properly protected by paint.

(c) All steel work, except where encased in concrete, shall be thoroughly cleaned and given one coat of acceptable metal protection well worked into the joints and open spaces.

(d) Machine finished surfaces shall be protected against corrosion.

(e) Field painting is a phase of maintenance, but it is important that unless otherwise properly protected, all steel work shall after erection, be protected by a field coat of good paint applied by a competent painter.

23. Erection

(a) The frame of all steel skeleton buildings shall be carried up true and plumb, and temporary bracing shall be introduced wherever necessary to take care of all loads to which the structure may be subjected including erection equipment and the operation of same. Such bracing shall be left in place as long as may be required for safety.

(b) As erection progresses the work shall be securely bolted up to take care of all dead load, wind and erection stresses.

(c) Wherever piles of material, erection equipment, or other loads are carried during erection, proper provision shall be made to take care of stresses resulting from the same.

(d) No riveting shall be done until structure has been properly aligned.

(e) Rivets driven in the field shall be heated and driven with the same care as those driven in the shop.

24. Inspection

(a) Material and workmanship at all times shall be subject to the inspection of experienced engineers representing the purchaser.

(b) Material or workmanship not conforming to the provisions of this Specification shall be rejected at any time defects are found during the progress of the work.

(c) The contractor furnishing such material or doing such work shall promptly replace the same.

(d) All inspection as far as possible shall be made at the place of manufacture and the contractor or manufacturer shall co-operate with the inspector, permitting access for inspection to all places where work is being done.

Dredging in the Yukon

A considerable proportion of the placer gold that comes from the Yukon Territory is mined by means of dredges, some of which are among the largest in the world, capable of excavating and treating 15,000 cubic yards of gravel per day. These dredges are operated by electric power and have been found to be most satisfactory. The period of operations is not confined to the short summer season prevalent in that district, as they can operate long after winter has set in. On one occasion a dredge operating on the Klondyke river was maintained in operation all winter.

Demand for Plumbing Materials in China

A brisk demand exists for plumbing materials in Tientsin, China, where a considerable number of modern buildings and warehouses are under construction, which will be equipped with water and steam heating apparatus, says the London Times Trade Supplement. Plumbing supplies are also required by railways, electric lighting companies, mines, and factories. Goods in demand are pipes and tubes, sanitary ware, heating devices, and materials for plumbing work generally. There is a market for small tools and hack-saw blades.

New Hotel for St. John

St. John, N.B., is to have a large modern hotel, operated and managed by the United Hotels of America, according to an announcement made by the firm of Thomas, Armstrong & Bell, Limited. The new hotel will be eight storeys high, and these will be approximately 200 rooms, all with baths or bath connections.

In Stratford, Ont., June was a good building month as 63 permits were issued for work at $55,455. The total value of work authorized so far this year is $261,962. Included in this are 59 houses.

Hints for the Contractor

Dragline Excavator for Sewer Cut

A combined sanitary and storm water sewage system is now being constructed by Booth & Flinn, Ltd., in 25th Street, North Beach, for the borough of Queens, city of New York. This work is part of the modern sewage disposal project recently adopted by the city of New York as a necessary step in the development of this borough. The section now under construction consists of a concrete cut-off chamber, junction chamber, overflow chamber, and screen chamber, the latter equipped with two 14-foot Rinsh Wurl revolving screens; together with 1,250 feet of reinforced concrete storm water sewer, 14 ft. 7 in. x 8 ft.; and 1,100 feet of reinforced concrete sanitary sewer, 9 ft. x 9 ft.

The two sewers are located side by side and are being constructed in a single trench, excavated by open cut. The design provides a space of 3 ft. 8 in. between the two sewers so that with sheeting and bracing the trench is 35 feet wide. The maximum depth is 38 feet, with an average depth of about 26 feet, and the material excavated is sandy clay on top with fine hard sand below, with the trench bottom from 5 to 7 feet below high water.

Dragline working on sewer excavation

This work is located in an undeveloped section, 25th Street being a proposed thoroughfare at this point, with ample room for casting the excavation on the trench bank. With this condition in mind, the contractors have adopted a method of excavation that is seldom practised in that section of the country, especially within the city of New York on sewage trench, that of the dragline excavator. For this purpose an Osgood 3/4-yd. heavy duty dragline is being used, operated by steam power and equipped with a 45-foot boom and a 3/4 yard Page dragline bucket. This dragline is fitted with continuous tread traction and rides on top of the cut and within the lines of excavation, somewhat to one side, and in operation drags the excavation in a circular fashion, with and across the cut. The material is loaded into motor trucks without any spilling and between trucks is cast on the bank, well back from the cut. The excavation is cast only on one bank, the opposite one being kept clear for passage of a travelling derrick for use in excavating the trench bottom.

The dragline excavation is 40 feet wide at the top, 35 feet wide at the bottom, and digs from 13 to 21 feet deep, depending on the stiffness of the soil, as the trench is not sheeted until after the dragline excavation has been made. This dragline has also been used in excavating, with a drag bucket, for the bottom in the sheeted sections, in sand and water, working between the bracing. The average progress has been about 350 yards, in place, for an 8-hour day.

The two sewers are being concreted by means of Blaw-Knox steel forms, with a travelling mixer plant located on top of the trench, while the backfill is placed from the cast spoil on the opposite bank.

Concreting Leakage Seams in Small Dam

Ingenious handling of difficult problems was involved in the repairs to the Ephratah dam of the Fulton County (N. Y.) Gas & Electric Co., recently undertaken, acording to "Engineering News-Record." The repairs were necessitated by leakage through seams in which the bond was weak, and through expansion cracks. The difficulty was increased by the decision to make the repairs from the upper side of the dam.

For the purpose of this undertaking a semicircular caisson 5 ft. across and 20 ft. deep was fashioned out of 1/4-in. boiler plate with reinforcement ribs of angle iron bent to fit the caisson, and with a bulkhead at the lower end. To float the caisson from one position to another oil drums were fastened at the top. When the caisson was floated into position against the face of the dam, a 4-in. siphon with 30 ft. of suction head drew the water from the interior. As the water level was lowered the leakage through the sides decreased because of the increased pressure and the resultant closer adherence of the caisson to the face of the dam. A 2-in. siphon took care of the leakage after the water had been practically all drawn off, until this leakage could be prevented by calking the space where the caisson faced the dam.

The leaks in the dam were repaired by cleaning the cracks or seams, building a protecting form over them and pouring concrete into the cracks. The concrete was allowed to set before the caisson was moved to its next position. Some of the patches were more than 12 ft. in length.

Planking and bolt stubs left in the face of the dam by the builders complicated the work, by making it difficult to seal the caisson. After some experience a 2-in. thickness of felt was applied to the edges of the caisson, replacing strips of rubber hose originally used to prevent seepage.

Machinery & Equipment

Traction Wheel Mounting for Railroad Type Steam Shovel

The Osgood Company has recently built, and successful tests have been made of traction wheel mountings for one of the heaviest railroad type steam shovels. The shovel, an Osgood 120, 6 cu. yd., has heretofore been mounted only upon standard railroad trucks but on account of the time necessary in laying track for moving the shovel, railroad truck mountings were slow in getting from one point to another. This size shovel is much used in big rock quarries and open mines and usually when blasting operations were in progress it was necessary to lay track and move the shovel back from the face of the excavation and then up again after the explosives had been set off. These operations were not only costly in time and labor consumed in making the changes, but also in decreased output through time lost, and steps were taken to overcome the difficulty by the Osgood Company.

Osgood railroad type shovel with traction wheels

Giant traction wheels were designed that measure 6 feet in diameter and have a face of 36 inches on the front or drive wheels and 30 inches on the rear wheels. The front wheels are used as drivers and power is delivered through a series of gears from the powerful hoisting engines on the shovel. Steering is accomplished by turning the rear wheels by means of a screw shaft and travelling nut. The nut, to which is attached the axle tongue, moves along the screw shaft, slewing the rear axle and wheels in the direction desired. The engine is controlled and steering accomplished by means of a single lever from the engineer's position in the forward end of the cab.

In recent tests made in a large Pennsylvania stone quarry the shovel was moved a distance in one day that under old track laying methods would have required at least ten days. The traction mountings are expected to revolutionize the use of large railroad type steam shovels in solid bottom quarries, mines, etc., where their use will be more practical than other types of mountings on acount of simplicity. The traction wheels also eliminate the necessity of pit men and of using jack arms. These items alone are a great saving in cost and time in moving the shovel forward to the face of the work.

The advantage of traction wheels over railroad trucks for large railroad type steam shovels, briefly summarized, are: greater mobility of machine, elimination of pit crew, easier accessibility to face of excavation, elimination of tracks and reduction of side strains and racking to the machine in general. Traction wheels also have a decided advantage over any other type of mounting in that the traction wheels are much less complicated, simpler to operate and have a much lower upkeep cost.

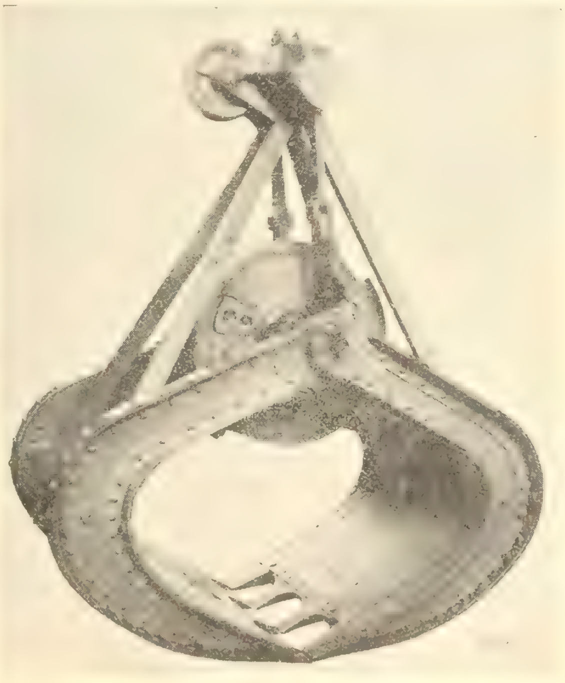
Some idea of the size of the shovel can be gathered from a few figures. The shovel has an over all length of slightly more than 85 ft. and the over all width is 20 ft., with a maximum height over the cab of 15 ft. while the boom extends to a height of 32 ft.

The Osgood Company is prepared to furnish traction mountings for their 120—6 cu. yd., 105—5 cu. yd., 73—3-1/2 cu. yd., and 69 ft. 2-1/2 cu yd. railroad type shovels. Traction mountings on the 43—1-1/2 cu. yds, have been standard equipment for some time and their successful use led to experiments which have developed the traction wheels for all sizes of railroad type steam shovels.

Link-Belt Company's Improved Wood Grapple

The wood grapple is the most effective and economical tool yet devised for unloading, piling and reclaiming evenly piled pulpwood and logs. It is usually handled and operated by a locomotive crane or double drum hoisting outfit, and is adapted for wood upwards of four feet in length.

In the latest design of the Link-Belt grapple, known as the "Improved Type," are incorporated all of the features and details which careful study and long experience have proved to be advantageous and desirable. The accompanying photo illustrates the very substantially reinforced, built-up, heavy section forged structural steel grapple arms, which gives maximum strength and resistance against breakage and distortion when handling frozen logs. Logs and pulpwood, regardless of length, have a tendency



Latest type wood grapple

INDUSTRIAL SCIENCE BY CAMERA

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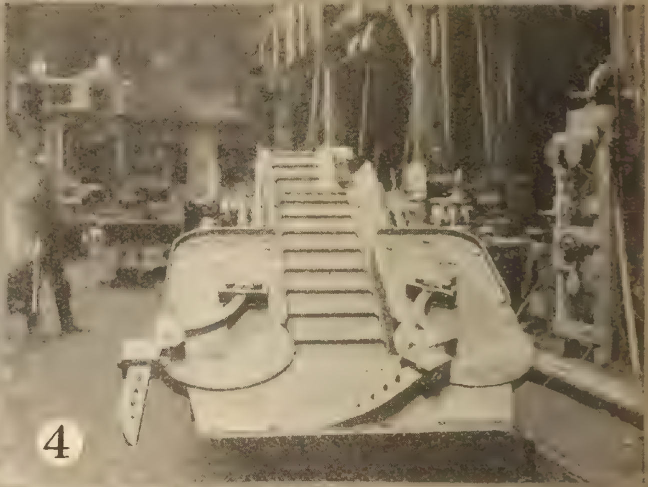
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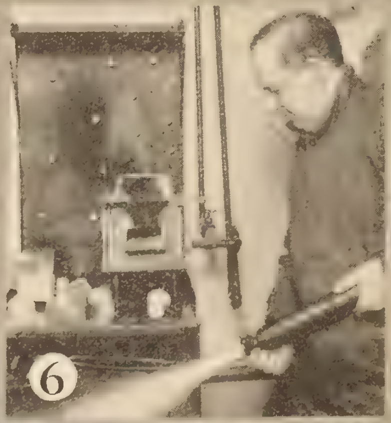
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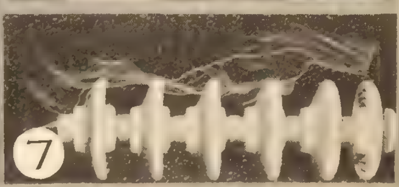
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(See page opposite for description)

to roll or slide into the grapple, the points or teeth being especially formed to cause this action. This insures full loads. The closing drum which is of steel to give long life affords long life to the closing cable. Fouling of this closing cable is prevented by the husky guard. The heavy and practically indestructible flat link closing chains are made of hardened steel, made especially for this service.

There are numerous other refinements throughout but the above are the salient features of the "Improved Type." This grapple will readily handle ⅝ cord of wood 8 ft. long, or a proportionate amount of shorter or longer wood. It weighs approximately five thousand pounds when emplty. This grapple is manufactured by Link-Belt Ltd., Toronto.

Building Permits Reports

The value of the building permits issued in 56 cities during May was practically the same as in April, there being an increase of .3 per cent. only, while as compared with the figures for the corresponding month of last year there was a slight decline of .8 per cent. According to statements tabulated by the Dominion Bureau of Statistics, building to the value of $17,593,615 was authorized in comparison with totals of $17,544,061 and $17,743,216 in April, 1923 and May, 1922, respectively.

Forty-seven cities furnished detailed reports, showing that they had issued approximately 2,500 permits for dwellings, valued at over $9,500,000; the number of dwellings to be built would be somewhat larger, since the construction of several houses or apartments is very frequently authorized by one permit. Some 4,700 permits were issued for garages, stores, factories, etc., at an approximate valuation of $5,800,000. In addition, authority was given for the erection of 3 grain elevators at Port Arthur and for several smaller engineering works in other cities, together estimated to cost nearly $1,800,000.

All provinces except Quebec and British Columbia reported greater anticipated activity in building; in the former there was a considerable decline from the high level recorded during April, while in the latter the reduction was comparatively slight. The most pronounced increase was that in Ontario of $2,383,688 or 31 per cent.

In comparison with the returns for May of last year Nova Scotia, New Brunswick, Manitoba, Saskatchewan, Alberta and British Columbia recorded decreases in the value of the permits issued, that of $765,586 or 59.7 per cent in Saskatchewan being the largest. In Quebec and Ontario there were increases of $714,580 or 18 per cent. and of $1,497,865 or 17.5 per cent. respectively.

The value of the building permits issued in Montreal, $3,524,825 was very much smaller than in April, when the total, $6,616,757 had been exceptionally high, but it was a good deal larger than in May, 1922. In Toronto and Winnipeg the amount of building authorized was greater than in the preceding month but rather less than in the same month of last year, while in Vancouver there were rather slight increases in both cases. The value of the building contemplated in Shawinigan Falls, Westmount, Hamilton, London, Niagara Falls, Owen Sound, Port Arthur, Windsor and Nanaimo exceeded the totals for both April, 1923 and May, 1922.

Slump at Galt, Ont.

There has been a decided slump in building operations this year in Galt, Ont., compared with the returns for the same period of 1922. During the month ending June, 28 permits were issued with a value of $16,755. For the first six months of last year, 63 permits with a value of $52,425 were issued, compared with 118 permits valued at $188,468.50 for the first half of 1922.

Industrial Science by Camera—Descriptions of illustrations on opposite page

1. In British Columbia they have to build regular railroads for the purpose of hauling the huge logs to the mill. Picture shows caterpillar steam shovel working on a fill.

2. After hauling logs several miles through the bush, one company dumps them off a trestle and tows by tug for the balance of the journey to the saws.

3. Alberta miners at rescue practice. Modern gas masks and safety lamps are used exclusively in Canadian mines.

4. The efficient-looking cutting head of a soft coal mining and loading machine. It is electrically operated and saves a tremendous amount of labor.

5. Producing and experimenting with two-mllion-volt current at the Pittsfield works of the General Electric Company. Being of the nature of lightning, it is hoped to reduce damage now done to electrical equipment by natural lightning.

6. Walter S. Josephson, a noted mechanical engineer, of New York, has been able to compress a new type of extremely expansive gas. When applied to hydraulic jacks tremendous weights can readily be raised. Small bottles are to be carried by motorists for inflating tires.

7. How high voltage jumps the longest insulators and frequently wrecks machinery costing many thousands of dollars.

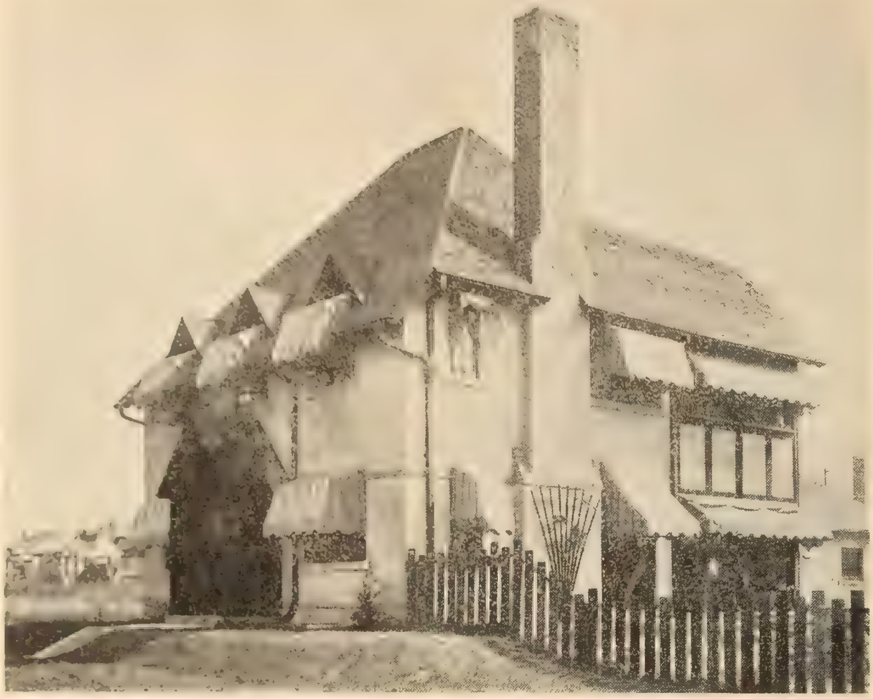
8. Crane operator on the construction work proceeding at Selfridge's big store in London is "tagged" by fair lady.

9. The Canadian Pacific "Empress of Canada" enters Vancouver harbour after vindicating beyond doubt Canada's claim to the blue ribbon of the Pacific. She is 22,000 tons, burns oil and crossed from Yokohama to Vancouver in 8 days, 10 hours and 55 minutes.

10. Controlling the traffic on roads leading to the famous British Derby by wireless. Motor trucks carry radio and telephones to connect up the observing aeroplanes and the traffic police at important intersections.

(The above photographs are copyrighted and reproduction is forbidden without permission).

The Dominion Fuel Board has just issued an Interim Report covering the coal situation in Canada at the present time. The situation during the past winter and early Summer is reviewed, but there is no intimation that steps have been taken to secure a coal supply in Central Canada for the coming Winter.



The Contract Record's Weekly House Suggestion No. 75

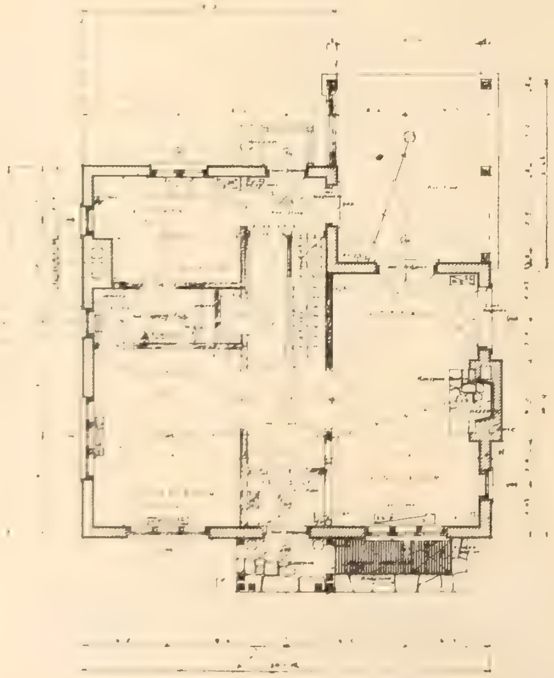
The beautiful home we are illustrating this week was erected recently for Mr. C. D. Hamilton, at the corner of Lascelles Ave. and Chaplin Crescent, North Toronto.

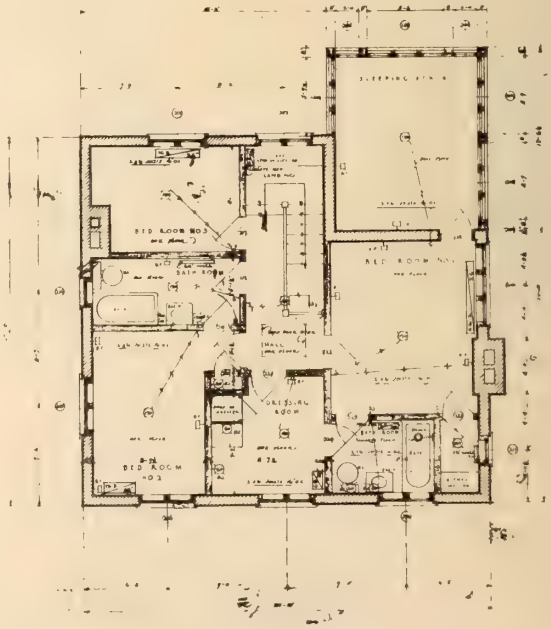
The construction is of hard burned brick, with a surface of cream stucco, finished with a pebble dash. Credit Valley sandstone is used in the foundation and trim, and the roof is of wooden shingles dipped two colors. The handsomeness of the exterior appearance is considerably enhanced by the pretty rock garden and pool.

The interior trim downstairs is of stained whitewood and is all cut to detail, including the doors. The flooring throughout is of quarter-cut oak, with the exception of the bathroom floors, which are of tile. The walls of the bathrooms are finished with Keene's cement, marked off in squares. The whitewood trim upstairs is finished with a white enamel. The ground floor trim has been carried down to the basement where a fine large billiard room is located, equipped with a handsome stone fireplace to the height of the ceiling. The basement is supplied with an abundance of natural light and makes a very acceptable addition to the living quarters.

The plans reproduced are so complete in detail that they require no comment. Messrs. Graham & Sibbett were the general contractors; the heating and plumbing was carried out by Bennett & Wright, the finest English porcelain bathroom fixtures being supplied; and the millwork was supplied by the Hancock Lumber Company, all of Toronto.

Messrs. Mathers & Haldenby, well known Toronto architects, who have planned many of the city's fine homes, were the designers of this residence.





Building in Guelph, Ont.

The total value of buildings in Guelph, Ont., for which permits have been issued up till July 1st, amounts to $313,643, as compared with $610,563 a year ago, when the collegiate-vocational school was included. It was just a year ago this month when the permit for that large item was issued, which accounts for the fact that the total permits for the month of June last amounted to $79,605, as compared with $430,100 in June of last year. Making allowance for the new school, it can be seen that the permits generally are keeping up very satisfactorily. Included in the list of permits for last month are quite a number of new houses, a feature of this year's building operations which has been most prominent and gratifying.

Mainly Constructional

East and West—From Coast to Coast

T. Jaccottey & Fils, general contractors, Montreal, is a recent registration.

The firm name of the Canadian Link-Belt Company, at Toronto, has been changed to Link-Belt, Limited.

The building business which has been carried on by Messrs. Gerrard & Lambert, at Kerrobert, Sask., has been taken over by Mr. J. J. White.

Messrs. Thos. W. Lobb and Wm. Boadway have formed a partnership under the firm name of Lobb & Boadway, and will carry on a building business at Mimico Beach, Ont.

The Mountain Stone Company, Ltd., with offices at Fort William, Ont., was recently granted a charter.

The Ontario Sand Co. Ltd., Toronto was recently granted a charter.

The sum of $281,000 was recently voted by the ratepayers of Outremont, P. Q., for the erection of a new Protestant school there. The new school will be located on Lajoie Ave., between Stuart and Dollard Avenues. Work will be commenced at once.

Rights of way have been secured and preliminary surveys completed, according to recent announcements for the line of the Eastern Maine Railway to be built from the international boundary to Bangor, Maine, for connection with the line of the Canadian National Railways from Meductic on the St. John Valley Railway This will give the C. N. R. an independent route between the Maritime Provinces and the New England states, and also will provide a new short line from Halifax to New York via Fredericton, which is believed to have transatlantic traffic possibilities.

Road construction is active in the Province of Quebec at the present time, work valued at over $5,000,000 being now in progress, on which a total of nearly 10,000 men are employed.

Work was commenced a few days ago on the construction of the new C. P. R. station at Fredericton, N. B.

Supplementary estimates in the House by the Hon. W. S. Fielding, Minister of Finance, a few days ago, included a $40,000,000 item for housing loans to the various provinces.

The two grants of $100,000 each from the Provincial and Dominion governments have made it possible to erect a much finer bridge structure over the Second Narrows, at Vancouver, B.C., than that originally planned and authorized by the ratepayers at the last election. Steel will be substituted for a large section of wooden piling and the latest type of bascule draw span will take the place of the swing span planned.

Bortolotti & Co. Ltd., builders and contractors, have been incorporated to take over the business of Bortolotti & Company, at Windsor, Ont., with a capital of $40,000.

Personal

Mr. Edward F. Drake, director of the Dominion Government Reclamation Service, has retired on account of ill-health. Mr. J. B. Challies, Director of Water Powers, will assume control of both departments.

Mr. G. A. Crane, has been assigned by the Provincial government to make a survey of the road conditions in Dryden, Kenora and the Rainy River districts of Ontario and to prepare plans for the improvement and extension of the highway system in this part of the province.

Mr. H. E. Pawson has resigned as chief engineer of the Municipal Electric Department at Sherbrooke, P. Q., to accept an appointment with the Nesbitt Thompson interests there.

Obituary

Mr. Joseph Gaston Legrand, aged 62, bridge engineer on the Western lines of the Canadian National Railways, died at his home in Winnipeg a few days ago. Mr. Legrand came to Canada from France in 1891 and engaged in his profession in Montreal until 1906. He went west as bridge engineer for the Grand Trunk and later became connected in the same capacity with the Canadian National Railways.

Mr. Hugh Doheny, a prominent Montreal contractor, died a few days ago at the Montreal General Hospital, after a two week's illness from pleurisy. Deceased, who was president of the firm of Hugh Doheny & Co. Ltd., was born in Montreal fifty-nine years ago and although his home had always been in that city, his contracting activities made him well known throughout the whole of Canada. His early activities were in connection with the construction of the main line of the C. P. R. along the north shore of Lake Superior in 1884. He later was employed on the construction of the Soo and Michigan lines and the C. P. R. line through the Crow's Nest Pass from Alberta to British Columbia. In 1889 and 1890 he was connected with the construction of the Sault Ste. Marie canal and shortly later did considerable work on the laying of tracks for the New Hampshire and Quebec Central railway lines. From 1901 to 1905 he built over 200 miles of lines for the Temiskaming & Northern Ontario Railway and from 1905 to 1911, associated with Macdonnell and O'Brien, he built 300 miles of lines for the Transcontinental Railway in Quebec. Other railway lines, the construction of which Mr. Doheny was connected with, were the Quebec & Saguenay Railway and the Canada & Gulf Terminal Railway from Mont Joli to Matane, Que. He was vice-president of the latter company at the time of his death. Mr. Doheny was a member of the Engineers' Club.

Trade Incorporations

Lynn, MacLeod Engineering Supplies, Ltd., with head office at Thetford Mines, P. Q., capital $10,000, to deal in machinery and engineering supplies.

Scotstown Granite Company, Ltd., with head office at Scotstown, P. Q., capital $250,000 to quarry and deal in granite, marble and stone for building purposes.

Tomlinson Construction Co. Ltd., with head office at Toronto, capital $100,000, to carry on a general engineering and contracting business.

The Brant Construction Co. Ltd., with head office at Burlington, Ont., capital $40,000 to carry on a general contracting business.

CONSTRUCTIONAL ACTIVITY

Period of July 4 to July 10, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Belleville, Ont.

Plans are being prepared by Messrs. Gore, Nasmith & Storrie, engineers, Confederation Life Bldg., Toronto, for additions to the water works system at Bellivelle, Ont., including a steel intake pipe, gasoline driven motor, water supply main and purification plant. Clerk J. W. Holmes. Tenders will be called about July 16.

Brockville, Ont.

The city council will shortly call for tenders for the following pavements: asphalt surface, William St., from Church St. to C.N.R. tracks; Church St., from Buell St. to Beecher St.; Buell St., from Church to Brock St.; bituminous macadam pavement, Ford St., from King St. east to Water St. east; Market Sq., from King St. to Water St, east. G. Dewey, Victoria Hall, city clerk.

Burks Falls, Ont.

Knight Bros. Company are contemplating new flume of frame and cement construction, also repairs to drain, at an estimated cost of $20,000.

Chilliwack, B.C.

The city will call for tenders for the construction of concrete sidewalks 5 ft., 6 ft. and 8 ft. wide about July 25. The work is estimated to cost $8,000. P. Brown, city clerk.

Clandeboye, Man.

The municipality of St. Andrews, Clandeboye, Man., has divided roadwork, costing $28,000, among the following contractors: Cautune, Mondar & Leonard, St. Boniface, Man.; J. McNab & G. W. Clarke, Clandeboye, Man.; and M. Twendun, G. McKenzie, P. Bilon, Whytebold, Man.

Cochrane, Ont.

Tenders for the construction of a sludge sewage disposal plant for the town will be received by R. C. Morston, town clerk, until July 19.

Hamilton, Ont.

The city council at Hamilton are contemplating the paving of Birch Ave., from Cannon St. to Barton St. City Engineer. W. L. McFaul.

City Council at Hamilton contemplates building of sewers on Sterling St., King to Ravine, at an estimated cost of $58,000. City Engineer, W. L. McFaul. Clerk, S. H. Kent.

Hamiota, Man.

J. E. Bowin, Winnipeg, Man. was awarded the contract for roadwork here by the local municipality.

Levis, P. Q.

Tenders are being received until July 19, by the city council of Levis, for a filtration plant, estimated to cost about $100,000, to be located at St. Laurent St. Clerk, Lionel Lemieux, city hall. Engineer, Edouard Hamel, St. Peter St.

Minto Township, Ont.

Tenders being receivel by Clerk, W. D. McLellan, Harriston, Ont., Until noon, July 16, for construction of 3 municipal drains as follows: No. 1, open ditch 25,800 cu. yds. excavation. No. 12, open ditch, 6,455 cu. yds. excavation and 3,550 lin. ft. tile drain; No. 11, open ditch, 17,422 cu. yds. excavation. Plans and specifications with clerk.

Moose Range District, Sask.

The Provincial Department of Highways, Regina, propose calling for tenders shortly for drainage work in the above district, estimated to cost $104,700. Project involves draining of 50,000 acres.

Ottawa, Ont.

The Standard Paving Co., Central Chambers, Ottawa, submitted the lowest tender for the paving of Bank St., from Pretoria Ave. to Bank St. Bridge, with asphalt and stone or wood blocks, estimated to cost $183,000.

Piapot East, Sask.

The Prov. Dep't. of Highways, Regina, is receiving tenders until Wednesday, July 25, for the excavation of approximately 37,300 cu. yds. of earth and other work required in the construction of provincial highway from Piapot East, 9 miles. Plans and specifications with the Department of Highways, Deputy Minister, H. S. Carpenter, Parliament Bldgs., Regina.

Port Moody, B. C.

Plans are being prepared by the municipal engineer, city hall, for additions to the water works system of the town, estimated to cost $25,000. A by-law will be submitted. Mayor, Perry D. Roe, City Hall.

Toronto, Ont.

Works Committee have adopted report of Commissioner Harris favoring construction of drainage system for North Toronto, to involve an expenditure of $11,125,000. system would include new sewage disposal plant costing $1,000,000.

Trail, B. C.

City council will shortly submit bylaw to ratepayers to cover the construction of flumes and cribbing at the Trail Creek Channel, estimated to cost $38,000. Mayor, A. J. Martin.

CONTRACTS AWARDED

Calgary to Stavely, Alta.

Contracts for the construction of highway from Calgary to Stavely has been awarded by the Pro. Gov't. of Pub. Works, Edmonton, to A. G. Foster, 1939-32nd Ave. S. W., Calgary, at the following figures:

Com. excavation 29 cents cu. yd.; solid rock excavation, 99 cents cubic yard; spike ploughing and spike stone $19. 100 ft.; scampying $1.85 per 100 feet; grading $1.85 100 feet; clearing $18.00 acre.

Chatham, Ont.

Paul D. Wampler, Chatham, has the general contract for drainage and dredging Marshy Creek for Sombra township council at $5,300.

Duncan, B. C.

Canadian Fairbanks-Morse Co., Vancouver, will supply a pump and motor for the waterworks system of the town at an approximate cost of $8,000.

Huntley Township, Ont.

Contract No. 1014 for grading in Huntley Township has been let by the Provincial Department of Public Works to Grant Bros. Construction Co., Banque Nationale Bldg., Ottawa.

Lindsay, Ont.

The town council has awarded the Standard Paving Co., Central Chambers, Ottawa. the contract for paving Wellington St., Cambridge to Sussex St.; Sussex St., Bond to Francis St.; Regent St., William to Victoria Ave.; Elgin, William to Victoria Ave.

Montreal, P. Q.

Leger Lemouex, Ltd., of Montreal, has been awarded the contract for paving Orleans St., Vermette to Rosemount Blvd., at $11,346.50.

Owen Sound, Ont.

F. F. Fry Co., 143 Scott St., Toronto, have taken over the general contract for approximately 5,000 lineal feet of 12 in. to 42 in. sewers awarded to Mitchell Contracting Co. Ltd., London, by the city council at about $53,000. The general contractors are in the market for square and round reinforced concrete pipe.

Contracts for laying pavements in Owen Sound have been let to the Warren Bituminous Paving Co. of Ont. Ltd. 54 University Ave., Toronto, at $75,000. Owner, city council. Engineer, D. H. Fleming.

Portage la Prairie, Man.

Contract for earth and rock fill for the the rural municipality of Portage la Prairie has been let to A. Fidler, Portage la Prairie.

Quebec, Que.

The Provincial Highways Department has awarded H. Marchessault & Cie. 2507 Lafontaine St., Montreal, the general contract for repairs to a section of the Montreal-Hull highway at $9,791.09.

Railroads, Bridges and Wharves

Deloraine, Man.

The secretary-treasurer of the municipality, D. L. Livingstone, will receive tenders until July 18 for the construction of two reinforced concrete culverts. Plans and specifications with the secretary-treasurer and at the office of the

Highway Commissioner, Parliament Buildings, Winnipeg.

Hillcrest, Alta.

Hillcrest Collieries Ltd., Hillcrest, Alta., contemplate the construction of a steel bridge costing $25,000. W. Hutchinson, Hillcrest, chief engineer.

Huntley Township, Ont.

The Carleton County Council have commenced construction of a concrete bridge structure between Cons. 4 and 5, opposite lot 24, Huntley Township. The work is being done by day labor, under the supervision of the engineers, Patterson & Byrne, 71½ Sparks St., Ottawa.

Kent County, Ont.

Tenders being received until July 14 for replacing of 2 bridges (existing structures 75 ft. long, steel pile trestle type) and the construction of 1 concrete and steel bridge, 28 ft. clear span over Chatham and Dover townline drain at River Rd. Plans and specifications with engineer, Mr. W. C. McGeorge, Harrison Hall, Chatham, Ont. Owner, County Council.

York Township, Ont.

Township Council endeavoring to secure assistance of county in construction of $150,000 bridge structure over Bathurst St. Ravine, north of Vaughan Rd. Township clerk, W. A. Clarke, 40 Jarvis St., Toronto.

CONTRACTS AWARDED

Blind River, Ont.

Thos. P. Charleson, 179 Gilmour St., Ottawa, has the contract for the reconstruction of wharf at Blind River, costing about $20,000.

Clarksburg, Ont.

The general contract for a concrete and steel bridge in Collingwood township has been awarded by the township council to Charles Mattain, Fergus, at an approximate cost of $7,000.

Grey County, Ont.

Messrs. Bryson, Irwin & Potter, Wiarton, Ont., have been awarded the contract for 4 reinforced concrete culverts at $3,200. Engineer, R. C. McKnight, 352, 8th St. W., Owen Sound, Ont.

Guelph, Ont.

Balconi & Battaglia, 170 Ferguson St., have the general contract for concrete bridges for Eramosa township costing $3,800. A. J. Aldous, Rockwood, clerk of Eramosa township.

Haileybury, Ont.

Thos. P. Charleson, 179 Gilmour St., Ottawa, has the general contract for the reconstruction of wharf for the Dominion Dep't of Public Works.

Montreal, Que.

Atlas Construction Company, 37 Belmont St., have been awarded contract for wharf construction "sec.31" for the Harbor Commission at Montreal Harbour. Mgr., M. P. Fennell, Jr., 57 Common St.

Regina, Sask.

The Provincial Government has awarded Gibbs Bros., Lumsden; John Kenward Co., Regina and John Cameron, Esterhazy, contracts for concrete bridges.

St. Francis Xavier, Man.

Lacour & Schioler, 187 Lyle St., St. James, has the contract for pile bridges for the municipality of St. Francis Xavier.

South Woodslee, Ont.

Maidstone township council has awarded Clarence Mitchell, c/o A. Mousseau, R. R. 1, South Woodslee, township clerk, the general contract for two concrete bridges to be erected on Puce Road.

Toronto, Ont.

Britnell Contracting Co., Baxter St., have the general contract for a reinforced concrete truss bridge across the Humber River for Vaughan township, at $6,200. Frank Barber & Associates Ltd., 45 Jarvis St., engineers.

Winnipeg, Man.

Harmen Bros., Virden Man., have the general contract for a new bridge at the rural municipality of Wallace, Virden, Man. The Manitoba Bridge & Iron Works, Ltd., Winnipeg, have the contract for the superstructure.

Public Buildings, Churches and Schools

Beamsville, Ont.

Bulk and separate tenders for the construction of Beamsville High School, estimated to cost $40,000, will be received by J. H. Sinclair, secretary of the board of education, until July 23. The building will be one storey high, 90 ft. x 100 ft., brick construction.

Birtle, Man.

Ratepayers at Birtle have approved of a by-law for a new hospital, submitted by the local Hospital Board.

Bradford, Ont.

Bulk and separate tenders being rec'd by secretary for all trades until 4 p.m., July 16, for new high school building for the School Board at Bradford, Ont. Plans and specifications with architect, D. R. Franklin, 587½ Yonge St., Toronto. Two storey and basement structure, 45 x 90 ft. Chairman of Board, C. C. Wilson.

Cherrywood, Ont.

Tenders are being received by the secretary of the School Board, A. R. Rittenhouse, R.R. No. 1, Pickering, Ont., for an addition to the school building at Cherrywood, Ont. Plans and specifications with the architect, J. T. Hornsby, 4 William St., N., Lindsay, Ont., with MacLean Building Reports, 345 Adelaide St. W., Toronto. and at the post office, Cherrywood.

Claremont, Ont.

Claremont School Board is having plans for a two storey brick school, 50 ft. x 80 ft., prepared by Walker & Gibson, 70 Victoria St., Toronto. Tenders will be called shortly. John Forgie, Claremont, secretary of the board.

Crystal Beach, Ont.

Hotel and casino owned by Dr. Thos. Snyder, Niagara Falls, N. Y., was damaged by fire here on June 28, to the extent of $70,000.

Dartmouth, N. S.

S. P. Dumaresq, Royal Bank Bldg., George St. Halifax, is preparing plans for a county home at Dartmouth, for the local county council, Court, House, Spring Garden Road, Halifax, estimated to cost between $100,000 and $150,000. Tenders will not be called until December.

Kinistino, Sask.

Tenders will be received by the Secretary treasurer of Kinistino School District No. 42, until Thursday July 19, for a school building there, estimated to cost $38,000. Architect, R. M. Thompson, Bank of Nova Scotia Bldg., Saskatoon, Sask. Plans and specifications with the architect and with the secretary treasurer.

London, Ont.

Electrical, plumbing, heating and plastering contracts for a synagogue costing $12,000 will be let by S. Jones, general contractor, 340 Tecumseh St.

Montreal, Que.

Ross & MacDonald, architects, 1 Belmont St., will let electrical, plumbing and heating contracts for Trinity Memorial Church. The structure is estimated to cost $200,000.

Tenders are being called by the Dominion Department of Public Works, R. C. Desrochers, secretary, Parliament Buildings, Ottawa, for alterations to the department's new examining warehouse at Montreal. Plans and specifications are with the chief architect of the department, Parliament Buildings, Ottawa and the assistant mechanical engineer, Dep't. of Pub. Works, Dominion Public Works Bldg., Palace Royale, Montreal.

Moose Jaw, Sask.

The Dom. Dep't of Public Works, through the secretary, R. C. Desrochers, Ottawa, are calling tenders until noon, July 24, for alterations and additions to the heating system in the Public Building, Moose Jaw. Plans are with the Department at Ottawa.

Ottawa, Ont.

Sealed tenders for the construction of a freight shed, office and waiting-room on the wharf at Chicoutimi, Quebec, will be received by the Department of Public Works, Ottawa, Until July 18. R. C. Desrochers, secretary of the department.

Plans are being prepared for the addition of one storey to the technical school on Albert St. Owner, Ottawa Collegiate Board.

Outremont, P. Q.

Plans are being prepared by MacVicar & Heriot, 628 Union St., for a school building to be built on Lajoie Ave., for the Protestant School Board. Sec.-Treas. W. F. Rowell, 64 Maplewood. It is expected tenders will be called shortly.

Pachena Point, B. C.

The Department of Marine & Fisheries will commence work soon on a $20,000 radio station here. The work will be carried out under the supervision of E. J. Haughton, 1230 Government St. Victoria. The chief inspector of the Department in B. C. is J. A. Motherwell.

Point Grey, B. C.

Tenders will be called by the Provincial Government about July 16 for the remodelling of Marpole Hospital annex, Point Grey, at an estimated cost of $25,000. Henry Whittaker, Parliament Buildings, Victoria, architect.

Port Credit, Ont.

The town council is having plans for a municipal building prepared by C. M. Hare, 70 Victoria St., Toronto.

Quebec, Que.

Tanguay & Chenevert, 20 d'Aiguillon St., are preparing plans for a three storey brick school, 60 ft. x 100 ft., to be built by the Quebec School Board in Notre Dame du Chemin parish on Marquette St. Tenders will be called in about two weeks.

Tenders for electric wiring, plumbing and heating for the medicine school for the Seminary of Quebec, will be called shortly. Bergeron & Lemay, 145 St. John St., Quebec, architects.

The Dominion Dep't. of Public Works, are receiving tenders until noon, July 27, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, for toilet building at the Champlain Dry Dock, Quebec. Separate tenders will be received for plumbing, heating and electric system. Plans and specifications with the Department at Ottawa, at the offices of the district engineers, Post Office Bldg., P. Q., Shaughnessy Bldg., Montreal, and post office at Lauzon, P. Q.

Rock Island, Que.

A three storey brick veneer school, 58 ft. x 60 ft., with concrete foundation, is contemplated by the school board. Georges Boisvert, secretary of the school board.

St. Anne de Bellevue, P. Q.

The Dominion Dep't. of Public Works are receiving tenders until noon, July 19th, through their secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, for the installation of boilers and other improvements at the military hospital, St. Anne de Bellevue. Plans and specifications with the chief architect, Dep't. of Public Works, Ottawa, and with the ass't mechanical engineer, Dep't. of Public Works, Dom. Pub. Works Bldg., Place Royale, Montreal.

St. Eloi, P. Q.

Plans are being prepared by P. Levesque, 115 St. John St., Quebec, P. Q., for a $60,000 church for the R. C. Parish at St. Eloi. Tenders will be called shortly.

St. Ignace, Que.

A frame church owned by the Roman Catholic congregation was totally destroyed by fire. The loss is estimated at $25,000. The building will be re-built.

St. Malo, Que.

Plans for a public hall for the parish are being prepared by Helidore Laberge, 103 St. John St., Quebec. The building will be three storeys, 45 ft. x 140 ft., brick construction. Tenders will be called shortly.

Toronto, Ont.

The date of July 20 has been set for the calling of tenders for the rebuilding of the Parkdale Canoe Club, Boulevard Drive, Toronto. Architects, Molesworth-West & Secord. The central building will be two storeys, 80 x 140 ft., with two boat house wings, 60 x 100 ft.

The Upper Canada Law Society, Osgoode Hall, have decided to postpone the proposed $75,000 programme of alterations to Osgoode Hall until next year. Architect Darling & Pearson, 2 Leader Lane.

Trail, B. C.

The city has passed a by-law authorizing the construction of a fire-hall costing $15,000 and the purchase of equipment costing $10,000. Walter Murray, Trail, fire chief.

Vancouver, B. C.

Franklin Cross, 448 Seymour St., Vancouver, is preparing plans for a $25,000 store and club quarters for the Vancouver Branch of the Army & Navy Veterans, 25 Hastings St. Vancouver. The building is to be 2 storeys, 50 x 80 ft.

CONTRACTS AWARDED

Cap Chat, P. Q.

Paul Cote, Capt Chat, P. Q., has the contract for building a $8,000 lighthouse for the Dom. Depart of Public Works here. Dimensions, 30 x 28 ft.

Coldwater, Ont.

Coldwater school board has awarded Webb & Son, Orillia, the general contract for a three room continuation school. Wilfred F. Smith, architect, Bank of Montreal Bldg., Midland.

Edmonton, Alta.

The city has awarded J. A. Peters, 1160-96th St., the general contract for a swimming pool and buildings costing $15,000.

Etobicoke Township, Ont.

Contract for the excavation of site for addition to school at Long Branch Camp, being built by S. S. No. 12, secretary Mr. Shannon, has been awarded to J. B. O'Brien, stop 36½ Lake Shore Rd., Port Credit, Ont. Patterson Electric Co., 615 Yonge St., Toronto, have the electrical contract. Architect, Walker & Gibson, 70 Victoria St., Toronto. General Contractors, J. S. Laxton, 4 Patterson Ave., Toronto.

Gravenhurst, Ont.

The school board has awarded Lester Crane, 16 Fairview Ave., Toronto, the general contract for a two storey school with basement, brick and steel construction, containing eight rooms. The building will cost about $60,000. All subtrades will be let by the general contractor.

London, Ont.

S. Jones, general contractor, 340 Tecumseh St., has let the following contracts for a $12,000 synagogue: steel, London Bridge Co., Burdlem Ave.; steel sash, Boca Steel Sash Co.; cement work, C. Thomas, 253 Briscoe St.; brick work, W. Wescott, 84 Euclid Ave.

Additional contracts awarded for the construction of a monastery for the Redemptorist Fathers are as follows: Plumbing and heating, Noble & Rich, 237 Queen Ave.; electrical, Knowles Electrical Co., Builders' Exchange; steel, London Bridge Works Ltd., Burdlem Ave.; cut stone, A. & E. Nobbs, William St.; plastering, G. Gould, 478 English St.; painting, W. T. Page, 251 Ridout St.

Mabou, Cape Breton,

Inverness county council has awarded the Parsons-Ed Co. Ltd., Lester Ave., Moncton, N. B., the general contract for the county asylum costing about $115,000. J. W. Mackay, Pictou, N. S., architect.

Montreal, Que.

G. Gagnon, 3383 St. Hubert St., has the contract for the stonework in connection with new church at 1854 Notre Dame St. E., for Saint Redempteur Parish. Architect, Gascon & Parent, 503 St. Catherine St. E., general contractor, Gratton & Girrard, 142 Sicard. Other sub-trades not yet let.

O. Archambault, 610 Lafontaine Park, has the general contract for a three storey, stone and brick garage, 75 ft. x 116 ft., for the Central Garage, 249 Laval Ave. The building will cost about $60,000.

Dominion Bridge Co. Ltd., Lachine, is supplying steel for Trinity Memorial Church. The plastering contract has been awarded to R. D. Clarke & Son, 26 Lincoln Ave.; E. Mapes has the painting and glazing contracts.

The Trinity Memorial Church at Montreal have awarded the following additional sub-contracts in connection with new $200,000 church on Sherbrooke St. W.; plumbing and heating, John Tweedle & Co., Lagauchetiere St. Wiring contract to be let. General contractor W. S. D. Cook, 10 Cathcart St.; architects, Ross & MacDonald, 1 Belmont St.

Mount Royale, P. Q.

Bremner Norris, Ltd., 65 Victoria St., have the general contract for the $40,000 addition to school for the Protestant School Board here. Architect F. G. Robb, 127 Stanley St. Address of the Board, 39 Belmont St.

New Hamburg, Ont.

C. L. Forler, R.R. No. 2, Baden, has the contract for a $10,000 school building at New Hamburg. Carpentry, masonry, roofing, plastering, painting, heating and plumbing will be let by the general contractor. Dr. Martz, secretary of the School Board.

Niagara Falls, Ont.

Robertson Construction Co., Bampfield Block, have the general contract for a railway station at Niagara Glen for the Queen Victoria Parks Commission. The building will be two storeys high, 54 ft. x 40 ft., rubble stone construction.

Oakville, Ont.

Carson & Elliott, Oakville, have been awarded the general contract for school for the local Board of Education, on Reynold St., $46,400. Architect, Wm. Connery. General contractor wants prices on materials and will let subtrades.

Ottawa, Ont.

J. M. Rolfer, Russell Theatre, Ottawa, has been awarded the contract for underpinning foundation work on church for the Christian Science Church, Melcalfe St., at $10,000.

Jas. Finn, 1 Hilda St., has the contract for repairs to the Arts Building, at Lansdowne Park, for the city council. Clerk, N. H. H. Lett.

Point Grey, B. C.

Roofing and sheet metal contracts for the first unit of the University group have been awarded to Campbell & Grill, 1238 Seymour St., Vancouver, at $14,000. Architectural Bronze & Iron Works, Toronto, will furnish sash, glass and glazing at $27,885

Port Hope, Ont.

The following sub-trades have been let in connection with the new Junior School for Trinity College, Port Hope: tile, National Fireproofing Co. of Canada, Ltd., Dom. Bank Bldg., Toronto: painting, Faircloth & Winfield, Ltd., 14 Mutual St., Toronto. General contractor, Gladman Construction Co., 76 Adelaide St E., Toronto. Architect, Sproatt & Rolph, 36 North St.

St. Boniface, Man.

The School District of St. Boniface

has awarded the contract for new school building at the corner of Cathedral and St. Jean Baptiste Sts., to J. A. Tremblay Company, Winnipeg, for $115.925. The plumbing, heating and ventilating contracts was also let to Chas D. Kirk Co. Ltd., 502 Tribune Bldg., Winnipeg, for $26,187. Architect, Geo. Northwood, 617 Union Bank Bldg., Winnipeg. Sec-Treas. G. A. Rocan, Banque du'Hochelaga, St. Boniface, Man.

Saskatoon, Sask.

The following sub-trades have been let in connection with school being built for the Saskatoon Public School Board: Plumbing and heating, Beaton & Brady, $5,100; electric work, Dawson Electric Co., $649.25; painting, R. F. Crossman, $1,561.12. General contractor, A. W. Cassidy & Co., 360—1st Ave., N. Saskatoon. Architect, J. Melrose Morrison, Drinkle Blk., Saskatoon.

The Goldie-McCulloch Company, Galt, Ont., will supply the boilers, super heaters and economicers for the $58,300 addition to the power house at the University of Saskatchewan. Stokers will be supplied by the Underfeed Stoker Co. of Can., Toronto.

South Vancouver, B. C.

General contract for addition to school at the corner of 29th Ave. and Culloden St., for the South Vancouver School Board, has been let to F. T. Sherbourne, 823 Granville St., Vancouver. No sub-trades let. Architects, Bowman & Cullerne, 606 Yorkshire Bldg., Vancouver. Chairman of the School Board, J W. Dingle.

Thessalon, Ont.

George P. Sandie, Thessalon, will build a two storey school, tile and brick construction, costing $32.000 for the school board. Tenders will be called later for plumbing and heating. E. C. Bridge, Thessalon, secretary of the school board.

Three Rivers, P. Q.

The Sisters de la Providence, Julie St., Sister Bourget, Principal, have awarded the general contract for the installation of a kiln and heating system at the St. Joseph Hospital, Chamfleur St., Three Rivers, to Messrs. Beaudry & Trepanier, 34 Badeau St. Architect, Asselin & Denoncourt, 42 Alexandre St.

Toronto, Ont.

The Board of Education at Toronto have let the following tenders in connection with school work at various schools: Marble and tile, Leslie Gardens, to Italian Mosaic & Tile Co., 429 Spadina Ave., $3,413; hardwood, Humberside Collegiate, to Canada Hardware Ltd., 53 Richmond St. E., $1,690; plastering, Jarvis Collegiate, John Boyce & Son, 21 Roylat Ave., $47,179; linoleum, Riverdale Technical School and Bowmore Rd., Murray-Kay Co. Ltd., 17 King St. E., $4,860; iron fence, Wilkinson School, Shipway Iron & Wire Mfg. Co. Ltd., 700 Wellington W., $2,174.

The following sub-contracts have been let in connection with the addition to the G.W.V.A. club house at 41 Isabella St.; steel, McGregor & McIntyre; painting and glazing, A. Williams, 522 Parliament St. Other trades to be let. General contractor J. Robert Page, 18 Toronto St. Architects, Page & Warrington, Conferedation Life Bldg.

The following contracts for the construction of Christ Church, R. E., have been awarded: Masonry, Gratton Ltd., 486 Clinton St.; steel, Hepburne & Disher, 71 Vanhorne St.; plumbing and heating, Fiddles & Hogarth, 122 King St. east.

Following sub-trades have been let for the new $30,000 Malvern Collegiate, by the Board of Education: Steel, McGregor & McIntyre, Ltd., 1139 Shaw St., $1,650; electric, Patterson Electric Co., 615 Yonge St., $585; heating and plumbing, Sheppard & Abbott, 119 Harbard St., $1,059; plastering, E. A. Murphy, 209 Degrassi St., $5,065. Secretary Treasurer of Board, W. W. Pearse, 155 College St.

Business Buildings and Industrial Plants

Bolton, Ont.

Woolen Mill of J. Walshaw & Son Ltd. was destroyed by fire on July 4. Loss to building $100,000 and contents, $50,000. The president of the company is Mr. E. A. Walshaw, 8 Ridout Ave., Toronto. They propose rebuilding soon.

Collingwood, Ont.

John Wilson, Huron St., is preparing plans for a factory for the Canadian Postal Lock-Nut & Bolt Co. of which F. A. Bassett, Collingwood is president. Tenders will be called shortly.

Fort William, Ont.

Tenders are wanted until Monday, July 16, for a store and office building on Victoria Ave., estimated to cost $90.000, for James Murphy, Simpson St. Tenders will be received by the architect, Mr. R. E. Mason, Francis Block, where plans and specifications may be seen. Building to be two-storey? structure, 100 x 105 ft., of brick construction.

Kitchener, Ont.

Among the general contractors who submitted tenders for the construction of the hospital for the Sisters of St. Joseph are: W. H. Yates Construction Co. Ltd., 17 Main St. east, Hamilton; R. Sheehy & Sons, 751 George St., Peterborough; P. H. Secord Construction Co. Ltd., 133 Nelson St., Brantford; Carswell Construction Co., 58 Wellington St. east, Toronto; Norman McLeod Ltd., Kent Bldg., Toronto; W. M. Sutherland Construction Co., 43 Adelaide St. West, Toronto; Dickie Construction Co. Ltd., Ryrie Bldg., Toronto; Casper Braun, 295 King St. west, Kitchener; Reitzel Bros., Allan St., Waterloo; Ball Bros., 32 Simeon St., Kitchener; Anglin-Norcross, Temple Bldg., Toronto; Dunker Bros., 58 Louisa St., Kitchener.

London, Ont.

H. C. McBride, architect, Molson's Bank Bldg., is preparing plans for lodge room and stores for Ailsa Craig Oddfellows, estimated to cost $12,000.

Montreal, P. Q.

Patrick Labelle, 721 Dorchester W., is contemplating the erection of a public garage.

Perry & Webster, architects, New York City, are preparing plans for a $200,000 paint factory for the Brandram Henderson Ltd., 2984 St. Urbain St. to be located at Montreal. It will be four storeys, reinforced concrete construction with steel frame. Tenders will be called shortly.

Toronto, Ont.

Mathers & Haldenby, architects, Manning Chambers, are preparing plans for an office building for a syndicate. The structure will be twelve storeys high, 50 ft. x 150 ft.

Harry Lucas, 16 Ellerbeck Ave., is receiving tenders for heating, plastering, plumbing and wiring for a store and apartment being built on Danforth Ave. at a cost of $10,000.

The plant of the Superior Macaroni Co., at 89-91 Centre Ave., Toronto, was damaged by fire to the extent of $6,000 recently. Owner will rebuild when insurance has been adjusted. The company's office is at 113 Elm St., Toronto, manager C. Calarco.

W. E. Barker, 186 King St. W. has purchased a site on the south west corner of Gerrard and Bay Sts. for a new office building, 30 x 69 ft.

Messrs. Molesworth, West & Secord, 43 Victoria St., are preparing plans for a new headquarters building for the Y. M.C.A. on McGill St., Toronto. Tenders will be called about July 20th.

Windsor Mills, P. Q.

Messrs. Kilgour Bros., 21 Wellington St. W., Toronto Ont., are calling tenders through the architect, D. C. Cotton, 54 Adelaide St. W., Toronto, for factory at Windsor Mills, P. Q., 2 storeys 90 x 120 ft., estimated to cost $100,000. Tenders close July 16.

Winnipeg, Man.

Wm. Page & Co., 334½ Smith St., general contractors on 7 stores at Portage & Beverley Sts., for Jos McGreevy, want tenders at once on the following sub-trades: Misc. iron work, electric, plumbing, plastering, painting and glazing.

CONTRACTS AWARDED

Hamilton, Ont.

At an approximate cost of $200,000 W. H. Yates Construction Co. Ltd., 17 Main St. east, will build a pattern storage building on Aberdeen Ave. for Canadian Westinghouse Co.

Kingston, Ont.

The Public Utilities Commission at Kingston, Ont., have awarded the general contract for the erection of an office structure to Douglas & McIlquaham, 400 Albert St., that city, at $9,863. The following subcontracts have also been let in connection with this building: Plumbing, Lemmon & Sons, 187 Princess St.; Carpentry, O. Aymroyd & Son, 21 Main St.; painting and glazing, T. McMahon, 206 William St.

Montreal, Que.

The general contract for a one storey addition to the factory of Sultana Limited has been awarded to Dancereau & Dancereau, 152 Hamilton St. Steel will be supplied by the Phoenix Bridge & Iron Works, 83 Colborne St. Roofing, plumbing and heating contracts have been awarded to Paquet & Fortin, 79 Cathedral St. Trussed Concrete Steel Co. 511 St. Catherine St. west, will supply reinforced concrete. The cut stone contract has been awarded to Villery Cut Stone, 848 Durosaire St. Cote Bros, & Burritt, 42 Conde St., have the contract for elevators.

General contract for machine shop "Sec. 30" at the Montreal Harbor, for the Harbor Commission, 57 Common St., has

(Continued on page 58)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

TENDERS

[illegible] tenders will be received by [illegible] for all trades required for the [illegible] of a High and Voca[illegible] School Building for the Beamsville Board of Education, until [illegible] p.m.

Monday, July, 23, 1923,

The lowest or any tender not necessarily accepted.

Plans, specifications and information may be obtained from Nicholson & Macbeth, Architects, 86 Queen Street, St. Catharines, Ontario.

J. H. SINCLAIR, Sec.-Treas.,
Board of Education,
Beamsville, Ont.

28-30

Tenders Wanted

Board of Education

Sealed tenders addressed to the Business Administrator and Secretary-Treasurer, Board of Education, Administration Building, 155 College St., endorsed with the word "Tender" and also with the name of the school building and trade or article to which it relates, will be received until

Tuesday, July 17th, 1923,

for

(1) Masonry, Structural Steel, Carpentry, Ornamental Iron, Roofing and Tinsmithing, Plastering, Painting and Glazing, Asphalt Mastic, Mechanical Trades, Wiring for NORTH TORONTO COLLEGIATE.
(2) Oil Burning Equipment for WINCHESTER SCHOOL.
3 [illegible] Boilers FRANKLAND SCHOOL.
(4) Asphalt Mastic for SILVERTHORNE SCHOOL.

The above trades are now ready.

The following will be ready on Wednesday, [illegible] 11:

(5) Ornamental Iron for JARVIS COLLEGIATE
(6) Asphalt Mastic for HUMBERSIDE COLLEGIATE.
(7) Safety Stair Treads for CHURCH ST. SCHOOL.
(8) Plaster Ceiling for HOWARD PARK SCHOOL.
(9) Fibre Mastic for ROSE AVENUE SCHOOL.
(10) Time Clocks for MALVERN COLLEGIATE.

Specifications and conditions of tendering may be seen and all information obtained at the office of the Architect of the Board, 155 College St., Telephone Trinity 8200.

Tenders must be in the office of the Secretarial Department at the Administration Building, 155 College St., **not later than 4 p.m. on the day named** after which no tender will be received.

The lowest or any tender will not necessarily be accepted.

W. W. PEARSE,
Business Administrator & Secretary-Treasurer.
H. L. KERR,
Chairman Property Committee,
Pro Tem

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 4, Section M, subsection (b)" will be received by the undersigned until eleven a.m. standard time, on

Wednesday, July 25th, 1923,

for the excavation of approximately 37,300 cubic yards of earth and other work required in the construction of Provincial highway from Piapot East—9 miles.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:—

Wm. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.; E A. Glover, Sec-Treas., R.M. No. 110, Piapot, Sask.

An accepted cheque for the sum of $700.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of three p.m. standard time, on Wednesday, July, 25th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways,
Regina, Sask.
July 4th, 1923. 28

For Sale

5,000 lin. feet of 2" pipe, 5,000 lin. feet of 1½" pipe in good condition, used only two months.
1 Sawyer Massey Road Grader.
1—50 ton bin and screen, with elevator and buckets.
1,000—lin. feet Blaw-Knox 6" road forms.
1—C. H. & E. Water Pump.
1—London Paver.
1—Buffalo-Pit Road Roller.

Box 291, Contract Record, Toronto. 25-29

COUNTY OF LINCOLN

Tenders
For Concrete Pavement

Sealed tenders, marked "Tender for Pavement," and addressed to Camby Wismer, County Clerk, St. Catharines, will be received until 6 o'clock P.M.

Wednesday, July 11, 1923,

for the construction of approximately 14,000 square yards of Concrete Pavement in the Village of Port Dalhousie.

Information pertaining to the work may be obtained from the County Engineer.

No tender necessarily accepted.

F. N. RUTHERFORD,
County Engineer,
St. Catharines.

27-28

Extension of Time

Date of receiving tenders has been extended to

6 p.m. Friday, July 20th, 1923

Sealed tenders addressed to the undersigned, and endorsed "Tender for Installation of Smokeless Boiler, Toronto, Ont." will be received until 12 o'clock noon, (daylight saving,)

Monday, July 16, 1923,

for the installation of a smokeless boiler in Government premises Nos. 22 - 24 Adelaide St. East, Toronto.

Plans and specifications can be seen and forms of tender obtained at the offices of the Chief Architect, Department of Public Works, Ottawa, and the Resident Architect, Department of Public Works, General P.O., Toronto, Ont.

Tenders will not be considered unless made on the forms supplied by the Department and in accordance with the conditions set forth therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p. c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or war bonds and cheques, if required to make up an odd amount.

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, July 3, 1923. 28

For Sale

Scotch Boiler 140 lbs., about 6 x 4 little used, completely equipped, and small steam engine.

WANTED; 25 to 35 H.P. Kerr engine in good condition.

CHAS. VAN SLAMBROUCK,
Blenheim, Ont.

28

TENDERS
For Concrete Bridges

Sealed tenders will be received up to 12 o'clock noon, on

Tuesday, July 17th, 1923,

for the Construction of the following bridges:-

A 28-foot span near Utopia; particulars may be obtained from Geo. L. Davis, Reeve of Essa Township.

A 22-foot span near Lisle, particulars may be obtained from Wm. Stephens, Reeve, of Tossorontio.

A 10-foot span near Rosemount, particulars may be obtained from Thos. Goodeve, Reeve, of Adjala.

Plans and specifications may be seen and forms of tender and all information obtained at the office of the undersigned.

The lowest or any tender not necessarily accepted.

WHEELOCK & CHRISTIE, Civil Engineers,
28 Orangeville, Ont.

County of Victoria
Ontario

Sealed tenders will be received by the County Engineer at the Court House, Lindsay up to noon,

Friday, July 20th, 1923,

for the cleaning and repainting of the following steel bridges:

Cowan's Bridge, Lot 11, Con. 6, Emily.
Little Bob Bridge. Lot 14, Con. 10, Verulam.,
Forest House Bridge, Village of Bobcaygeon.
North Bridge, Village of Bobcaygeon.

Specifications and forms of tender etc., will be given out at the office of the County Engineer.

Tender must be accompanied by a marked cheque, or Bid Bond equal to five (5%) per cent of the value of the contract.

The lowest or any tender not necessarily accepted.

E. L. MILES,
County Engineer,
28 Lindsay, Ont.

DEPARTMENT OF ROADS

TENDERS

St. Bruno-Roberval-St. Bruno Highway

Tenders made on forms supplied by the Department of Roads and placed under envelopes bearing the words: "Tender", followed by the name of the interested highway and of the municipality, shall be received at the office of the Minister of Roads, in the city of Quebec, Government Building until twelve o'clock of the afternoon (Eastern Standard time), on

Monday the thirtieth (30) of July, 1923,

for the construction in gravelling of St-Bruno-Roberval-St. Bruno Highway in the municipalities of St. Methode, length 26400 feet; the township of Normandin, length 13400 feet and the township of Albanel, length 15840 feet.

The Government of the Province of Quebec does not bind itself to accept any of the tenders.

J. L. BOULANGER,
Deputy Minister.
Quebec, July 6th, 1923. 28

Alterations to School
Cherrywood, Pickering, Ont.

Sealed tenders for supplying of all labor and material, equipment and tools required for alterations to School situated in the Village of Cherrywood, Township of Pickering, County of Ontario, will be received by the undersigned up until three o'clock

July 14th, 1923,

Each bid must be marked signed by bidder accompanied by a certified cheque on a chartered bank for 2½% or bid bond for 2½%. Tenders shall be mailed in sealed envelopes clearly marked with Bidder's name and trade.

Plans and specifications may be seen at the Post Office, Cherrywood or at the office of MacLeans Building Reports, 345 Adelaide St. West, Toronto, or at the Architect's Office, 4 William St. North, Lindsay.

(Sgd.) A. R. RITTENHOUSE, Secretary,
28 R.R. No. 1, Pickering, Ont.

Tenders for the Construction of the Leaside Public School, Leaside, Ont.

General tenders only will be acceptable, and must be on special forms and in sealed envelopes, which will be furnished for this purpose by the Architects.

Deposit of a marked cheque of 2½% of the amount of the contract or a Bid Bond is required with each tender, and when the contract is executed a bond of 50% of the contract will be required.

The building is to be completed by Jan. 1st, 1924.

Tenders must be in the hands of Thomas Johnson, Secretary of the Board, Leaside, Ontario, by

July 25th, 1923,

A deposit of $25.00, is required by the Architects to procure plans. In the event of the plans not being returned on the date agreed, the said deposit will be forfeited.

Plans, specifications, Tender Forms and information may be had at the office of the Architects.

S. B. Coon & Son, 4 St. Thomas St., Toronto.
28

City of Belleville

Tenders for Water Works

Sealed tenders will be received up to 12 o'clock noon ot

Thursday, July 19, 1923,

for the following works:

Supplying 30-inch steel pipe, flexible joints, etc.

Laying 30-inch steel intake pipe and constructing substructure for pumping station.

Supplying Revolving screen.

Supplying one 30-inch hydraulic valve.

Plans and specifications may be seen and tender forms obtained at the office of GORE, NASMITH & STORRIE, Consulting Engineers, 625 Confederation Life Building, Toronto, and from E. T. Austin, Water Works Manager, City Hall, Belleville.

Council reserves right to reject any or all tenders

G. A. BENNETT,
Mayor.
H. A. THOMPSON,
Chairman, Water Works Committee.
Belleville, July 5, 1923. 28

TOWNSHIP OF MINTO

Tenders Wanted

Tenders will be received by the undersigned up to noon on

July 16th, 1923

for the construction of three Municipal Drains in the Township of Minto, as follows:-

Drain No. 1 Open ditch, 25,800 cu. yds. of excavation.

Drain No. 12 Open ditch, 6,455 cu. yd. excavation and 3,550 lineal feet of tile drains.

Drain No. 11 Open ditch, 17,422 cu. yds. of excavation.

Plans and profies can be seen at the office of the undersigned, Harriston, Ont.

A marked cheque for 5% of the amount of the contract must accompany each tender as guarantee of good faith and a contract bond will be required from the successful tenderer.

The lowest or any tender not necessarily accepted.

W. D. McLELLAN,
Clerk of Minto,
27-28 Harriston, Ont.

For Sale

Fireproof vault doors in good condition, apply Box 304, Contract Record, Toronto. 28-31

For Sale

Half million hard wire cut brick for immediate delivery. Box 309, Contract Record, Toronto.
28

Wanted

Driver for Truck. State experience and wages expected. Box 312, Contract Record, Toronto. 28

Wanted

3 1½ yard Dump Wagons. Apply Box 314, Contract Record, Toronto.
28

Wanted

Experienced general foreman for concrete bridge work, outside city. Apply Box 313, Contract Record, Toronto.
28

Camp Outfit Wanted

Contractor wants used camp outfit consisting of Tents, Blankets, Stoves, etc. Write Box 315, Contract Record, Toronto.
28

FOR SALE

One London Concrete Paving Mixer, 10 ft. Price reasonable. Apply Kennedy Construction Co. Ltd., 137 McGill Street, Montreal 28

STEEL PILING

Bought and Sold

Universal Equipment Company

28 Niagara Falls.

Wanted

Wanted to rent Steam Shovel for six weeks State make, rental and where same may be seen. Box 311, Contract Record, Toronto. 28

For Sale—Cheap

1—6 ft. Wettlaufer Mixer on trucks with side loader and gasoline engine. Overhauled and painted and in good running condition. K. W. Lewis, 105 Front St. East, Toronto, Ont.—28 T.f

For Sale

Model 60, Marion Shovel, 2½ yard dipper, Boiler 140 lbs. Pressure, located at Port Arthur, has worked only four months in gravel. $7,000 cash as it is and where it is. Apply Box 92 Contract Record, Toronto. 26-28

Cableway and Plant for Sale or Rent

One cableway and plant, complete, consisting of:—

1 40 H P Locomotive Type Boiler.
1 Pair of cableway engines, 9 x 12.
2 A Frames and 8 sheaves. Wire, Rope, carriage, etc.
We also have stiff leg derricks.
1 36" Symonds Disc Crusher.
2 No. 4 Jenckes and 1 No. 3 McCully Gyratory Crushers.

And other miscellaneous equipment.

JAFFE MACHINERY EXCHANGE,
53 Montfort St., Montreal.
Main 8398 27-28

CONTRACTORS SUPERINTENDENT requires position; well up in reinforced concrete and all classes of construction, life long experience, excellent references, quantities and estimating, apply Box 305, Contract Record, Toronto. 27-28

CIVIL ENGINEER with contracting and executive experience and the very best of references would like to make connection with a going contracting firm or hear from somebody who needs the services of such a man. Am in a position to invest some money in a sound proposition. Box 303, Contract Record, Toronto 27-29

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OF CANADA LIMITED
THIRTY SIX TORONTO STREET

CAST IRON PIPE FOR SALE

30", 24" and 10". Cheap.

L. S. Tarshis & Sons,
26-28 Toronto.

Business Buildings and Industrial Plants

(Continued from page 55)

been let to Quinlan, Robertson & Janin, 50 Notre Dame St. Mgr. of Commission, Mr. W. P. Fennell Jr. General contractor will decide which sub-trades will be let.

Port Credit, Ont.

The masonry contract for a $5,000 store and apartment building at stop 35 Lake shore Road, has been let to H. Stone, stop 35 Lake Shore Road; carpentry, E. Harrison, Stop 28½ Long Branch; electric, H. Lond stop 35 Lake Shore Rd.; heating and plumbing, C. Barlow, stop 34 Lake Shore Rd. General contractor, J. B. O'Brien, stop 36½ Lake Shore Rd. Owner, John Lavelle, 104 West Lodge Ave., Toronto.

Sault Ste. Marie.

McPhail & Wright, Govin St., have the contract for the erection of a 3-store block on Queen St., for Col. P. T Rowland, 21 Summitt Ave., at $15,000. Electric, plumbing and heating to be let by owner. Steel, plumbing and furnace not purchased.

Three Rivers, P .Q.

General contract for extension to factory on Bellefeuille St., for Geo. Christie Co. Ltd., Govan, Glasgow, Scotland, has been awarded to Beaudry & Trepanier. 34 Badeaux St., at $30,000.

Toronto, Ont.

The heating and plumbing contract, in connection with $20,000 store and bank building being built at Danforth & Woodbine Aves., for the Canadian Bank of Commerce, has been let to W. T. Bodwell, 1171 Danforth Ave. Frank Copley, 450½ Montrose Ave., has the plastering contract. Architect, Dominion Realty Co., 23 King W.

Masonry contract for $18,000 planing mill, near 496 Gladstone Ave., for Jas. T. Gilchrist Lumber Co., 496 Gladstone Ave., has been let to John S. Laxton, 6 Ridley Gardens. Painting, electric, plumbing and heating trades to be let.

The following sub-trades have been let in connection with 8-storey warehouse being erected by E. G. M. Cape Company, of 920 New Birks Bldg., Montreal, for Cassidy's Ltd., of 51 St. Paul St. W., Montreal, on Front St., Toronto: roofing and sheet metal, Douglas Bros. Co. Ltd., 10 Benoit St., Montreal; plastering, E. J. Curry, York Bldg., Toronto; glass, Hobbs Mfg. Co. Ltd., 121 Liberty St., Toronto; tile, National Fireproofing Co. of Canada, Ltd., Dom. Bank Bldk., Toronto. The balance of sub-trades will be let by the general contractor shortly in Montreal. Architect, MacVicar & Heriot 628 Union Ave., Montreal.

Following sub-trades have been let in connection with $50,000 storage warehouse being erected on Church St., north of McGill, for the W. J. Pickard, Ltd., 365 Church St.; roofing and sheet metal, Wm. A. Moffatt Co., 86 Don Esplanade; electric , Toronto Electric Co., 101 Duke St. Architect. J. G. Kent & Sons, Confederation Life Bldg., Toronto.

The plumbing and heating contract in connection with alterations to the building of the Toronto Transportation Commission, on the northeast corner of Yonge & Front Sts., has been let to Sheppard & Abbott, 119 Harbord St.

W. T. Joy, 86 High Park Ave., has been awarded the contract for the new $150,000 addition to the lunch room of Bowles Lunch Room Ltd., at 7 King E. It will be a 3-storey building, 30 x 100.

Additional sub-trades let recently on new $110.000 garage on Bancroft St., for the City Dairy Co. Ltd., Spadina Cres., were as follows: roofing and sheet metal Wm. A. Moffatt Co., 86 Don Esplanade; glass and glazing, Toronto Plate Glass Company, 21 Don Roadway. Painting contract has not been let. General contractor is Sullivan & Fried, 81 Victoria St. Engineers, Gore, Nasmith & Storrie, Confederation Life Bldg.

The following sub-contracts were awarded recently in connection with the alterations and addition to the factory of the Ault & Wiborg Co. of Canada, 19 Charlotte St., Toronto: steel sash, Canadian Metal Window Co., 160 River St.; steel McGregor & McIntyre, 1139 Shaw St. Roofing, painting and plastering to be let by the general contractor. H. A. Wickett & Co. Ltd., 127 Front St. E., and the plumbing, electric and heating contracts will be let by the architect, Messrs. Sproatt & Rolph, 1162 Bay St.

The following sub-trades have been let on the new car barns, Roncesvalles Ave., by the Toronto Transportation Commission, 35 Yonge St.: glass and glazing, Toronto Plate Glass Co.. 90 Don Roadway; wire screens and lockers, G. B. Meadows Company, 479 Wellington St. W.; plastering, R. C. Dancy, 57 Kendall Ave. Painting is still to be let. General Contractors, Sullivan & Fried, 81 Victoria St.

Victoria, B. C.

Hodgson, King & Marble, 508 London Bldg., Vancouver, B. C., have the gen-

(Continued on page 60)

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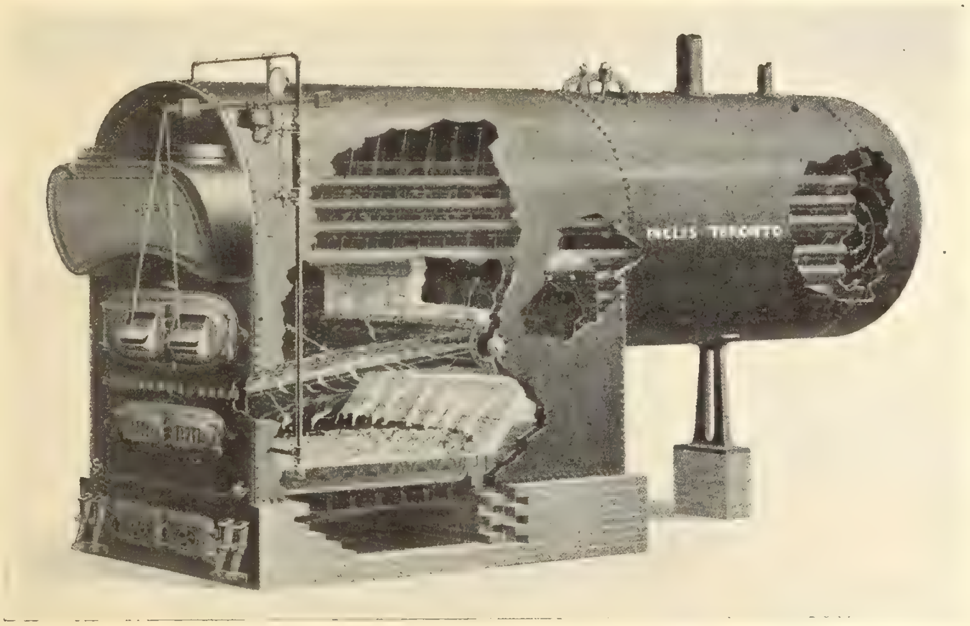

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Montreal Sales Office—385 Beaver Hall Square

Business Buildings and Industrial Plants

CONTRACTS AWARDED

(Continued from page 58)

[illegible] contract for the new $200,000 Bank Bldg., at the N. E. corner of Yates & Douglas Sts., for the Bank of Nova Scotia. Local manager, J. W. Corning, Times Bldg., Victoria. Architect, A. Arthur Cox, 909 Birks Bldg., Vancouver.

Windsor, Ont.

The Fleischmann Yeast Company, 735 London St. W., have awarded the general contract for office, warehouse and flat to T. F. Jones & Sons, 167 Church St., St. Catharines, Ont., at $18,000. Sheet metal, electric, plumbing and heating contracts will be let by general contractor.

Messrs. McNaughton McKay Electric Company, Pitt St. E., Windsor, have the electric contract on the new $30.000 addition to the garage on Wyandotte St. for the Universal Garage, Chatham St. John V. Gray Construction Co. are the general contractors.

Electrical contract for $15,000 store and flats structure being built on Sandwich St. E., for N. Cherniak, 105 Sandwich St. was let recently to Jos Brown, 500 Tecumseh St.

Winnipeg, Man.

Sutherland Construction Co. Ltd., Merchants Bank Building, Winnipeg, will make alterations costing $20,000 to a warehouse owned by the Midland Railway Co. of Manitoba.

Residences

Brantford, Ont.

Percy Gillingwater, 874 Marlboro St., is contemplating the building of a $8,000 residence on Dufferin Ave., Brantford.

Cannington, Ont.

J. Hunt Stanford & Son, 67 Yonge St. Arcade, are preparing plans for an $18,000 residence for N. D. MacKinnon, Cannington, Ont.

Humberstone, Ont.

Cody Land Corporation, Ellicott Square, Buffalo, N.Y., have purchased 150 acres here and will start housing development to include 25 houses, which they will dispose of on the instalment plan.

London, Ont.

S. E. Weir, 138 Oxford St. W., is considering erection of $5,000 residence on Victoria St.

Mimico, Ont.

Tenders wanted for all trades in connection with $5.000 residence to be built on Superior Ave., by Dr. F. Davidson, Church St., Etobicoke. Architect, J. Davidson, Church St. Etobicoke.

Moncton, N. B.

Roofing, electrical, plumbing and heating contracts for a frame residence with concrete foundation, costing $8,000, will be let by R. W. Benjamin, Fourth St., general contractor.

Montreal, Que.

W. Larose, 397 Bercy St., wants prices at once for roofing, electrical, plumbing, plastering and brickwork contracts for a residence costing $6,000.

Max Brucker, 367 St. Catherine St., is receiving tenders for the construction of a 4 storey apartment building, 43 x 76 ft. to be erected at 169-179 Stanley St. Owner's address, 367 St. Catherine St. Dimensions of building, 43 x 76 ft. Old building on site being wrecked.

A. Nault, 418 Aylwin, is building a $6,000 residence on Prefontaine, between Ontario and Rouen Sts., and will probably let roofing, electric, plumbing, plastering, millwork and brickwork trades.

J. E. Huot, 304 University St., is preparing plans for a cottage at Montreal. Tenders will be called in about a week's time.

Ottawa, Ont.

Ernest Flexman, 830 Bank St., is receiving tenders for plumbing, heating and wiring for a $10,000 brick veneer residence under construction on Central Terrace.

David Arbuckle, 215 Argyle Ave., will require about 14,000 brick and other materials for a $9,000 residence.

Outremont, P.Q.

Robert Neville, 826 Dorchester W., Outremont, is calling tenders for roofing, electrical work, plumbing, heating, plastering, painting and tiling of 2 cottages, valued at $25,000, now under construction on Ste. Catherine Rd. near Davaar. Architect, Perreault & Gadbois, 2100 Park Ave.

Point Grey

William J. Read, 2115-15th Ave. W. is building a $10,000 residence at 3857 Granville St. Architect Townley & Matheson, 325 Homer St. Vancouver. Sub trades not let yet.

Sandwich, Ont.

Tenders are wanted on the electric work, heating, plumbing, plastering and painting of $7,000 residence being built on Sunset Ave., by Walter Hales, Sandwich St.

Sorel, Que.

Fire destroyed stores and residences owned by Arthur Chapdelaine. The damage is estimated at $20,000.

Three Rivers, P. Q.

Tenders are wanted for masonry, plumbing, heating and plastering of a $5,000 residence on St. Christophe St., for Alphonse St. Pierre, 20a St. Oliver St.

The following trades will be let in connection with a $6,000 residence for Acme Dion, 179 Ste. Ursule St.; masonry, electric, plumbing, heating and plastering. No materials purchased.

J. L. Fortin, Bonaventure St., contemplates the erection of a $12,000 home at Lanolett & Ste. Martin Sts.

Tenders are wanted for masonry, electric, plumbing, heating and plastering in connection with $6,000 residence being built on St. Paul St., by Victor Gagnon, 314 Ste. Angele St.

Toronto, Ont.

Milton S. Pierce, 233 Wright Ave., is building a $9,000 residence at 54 Lascelles Ave., and wants tenders on the painting, electric work, plastering, plumbing and heating.

Tenders are wanted on electric work, plastering, painting, heating and plumbing in connection with 3 residences, costing $11,000, being built on Woodmount Ave., by H. Duff, 2763 Danforth Ave.

Allan O. Thompson, 108 Heath St. is building 2 pair and 3 single residences on the west side of Holly St. near Soudan Ave. and will require materials. Carpentry and masonry by day labor.

Sub-trades, including painting, plastering, electric, plumbing and heating, to be let for 2 pair of residences being built by Thomas & Andoniadis, 316 Rhodes Ave., valued at $41,000.

E. Maguire, 2 Beatrice St., is building a $10,000 residence on Old Orchard Grove, near Ridley Blvd., and will let sub-trades, except masonry and carpentry which are being done by day labor.

Roofing, plumbing, plastering and electric contracts to be let for 4 residences, valued at $20,000, now being built on the north side of St. Germain Ave., by Wm. B. Walton, 24 Adelaide St. E. Carpentry and masonry is being done by day labor. No materials purchased.

G. Barlay, 27 Ward St., will start work shortly on 5 residences, to cost $3,000 each, on the west side of Bicknell Ave. A site 100 x 60 ft. has been purchased.

Tenders are wanted for painting, heating, plastering, electric and plumbing in connection with 2 pair of residences, to cost $9,000, on Kenilworth Ave., for Gerald Bunker, 292 Runnymede Rd.

Verdun, P. Q.

Masonry, electric, plumbing, plastering and painting cantracts will be let in connection with $8,000 residence and garage being built on Hickson St., by Nap. Lavie, 1200 Bond St.

Tenders are wanted for masonry, roofing, electric and plastering in connection with $7,000 residence being erected on Church Ave., by A. Duclos, 488a Church Ave.

Westmount, P. Q.

Tenders being called (no closing date set) for residence at Trafalgar & Mt. Pleasant, for Jas. M. Morris, c/o Fox & Morris, Board of Trade Bldg. Architects, Fetherstonhaugh & McDougall, 85 Osborne St.

Windsor, Ont.

North American Cities Co., 309 Pelissier St., want tenders for heating, plastering, plumbing and electric work on new 7,000 residence they are building on Victoria Ave.

Winnipeg, Man.

C. T. Lount, Union Bank Bldg., Winnipeg, will let sub-trades on $9,000 residence being built on Brock Ave.

E. Russell, 249 Waverly St., Winnipeg, is building a $15,000 residence on Kingsmay St., and will want tenders on sheet metal, electric work, plastering, painting, and glazing.

CONTRACTS AWARDED

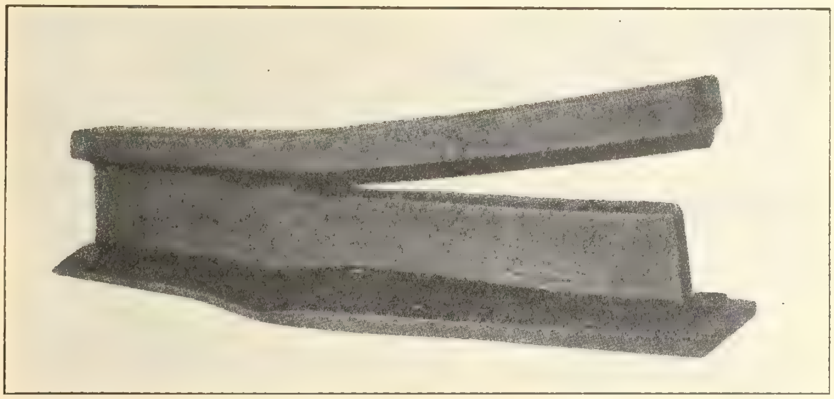
Cap de la Madeleine, P. Q.

Following sub-trades let on $6,000 residence for Pierre Loranger, Notre Dame St.; roofing, H. Massicotte & Freres, Ltd.; electric, N. Montplaisir; painting, Geo. St. Pierre, all of Cap de la Madeleine. General contractor, W. W. Rosseau, Cap de la Madeleine.

Chatham, Ont.

Isaac Moore, 16 Ellwood Ave., has the general contract for a $6,500 brick residence for Warren Ayr, Glen Block, William St.

BURLINGTON STEEL
COMPANY, LIMITED
HAMILTON CANADA



"Close-up" of a rail part of which has passed through the slitting mill. Showing how the rail is slit into three separate parts—the head, web and flange.

The Re-rolled Argument

Rail Steel Reinforcing Bars are sometimes referred to as being "re-rolled." This term applied to Rail Steel is a misnomer.

In rolling Rail Steel Bars, the rail is separated into three parts, the head, web and flange; and these parts are treated individually as billets and rolled into bars, or other sections. The Rail Steel Bar is the result of a continuation of the rolling process, and is in no sense a "re-rolled" product.

The objection to the term "re-rolled" is that it permits confusion of Rail Steel Bars with bars re-rolled from various kinds of scrap, shell discard, etc.

It is important to note that the A.S.T.M. Specification A-16-14 covers "Rail Steel Concrete Reinforcement Bars," and no mention is made of "re-rolled" bars. Furthermore, under "Process" this specification stipulates that the "bars shall be rolled from standard section Tee Rails."

Rail Steel Bars are not "re-rolled" bars, and if you specify bars to meet A.S.T.M. Specification A-16-14, no undesirable re-rolled material can be substituted.

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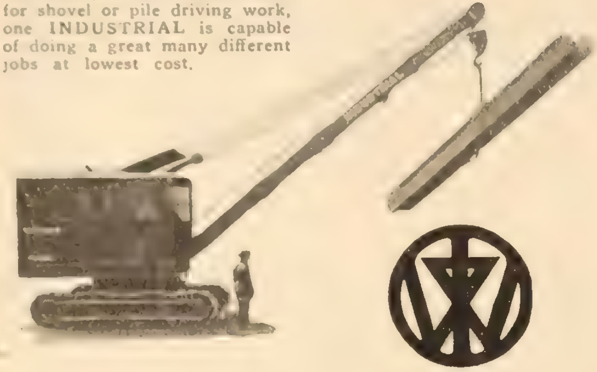

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Bonded for
20 and 10
Years

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2. That the slag or gravel which holds in place the heavy, *poured* (not mopped) top coat of Specification Pitch, makes it possible to use more than twice the amount of waterproofing material that is practical where no wearing surface is laid. This fact holds good regardless of the type of bituminous material employed. And, as you know, it is the amount of waterproofing material that goes into a built-up roof that largely determines its life and service.

3. This wearing surface protects against surface wear—defies the scuffing of heavily shod workmen. The firmly imbedded gravel or slag is proof against erosion or washing away.

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Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.45
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	10.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	25.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*†	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	25 00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00**	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base	4.00 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.00 "	5.10 base	
Hoops	per 100 lbs.	5.00 "	3.75 "		
Twisted and deformed bars	per 100 lbs.	3.90 "	4.00 "	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	4.00 "	4.00 "	5.35	6.00
Structural shapes	per 100 lbs.	3.90 "	4.25 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.15	6.25
Plates—3/16 in.	per 100 lbs	4.40 "	4.25 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.50 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.50 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
Cast iron pipe	per ton	65.00 "	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.45	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.80.
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STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.

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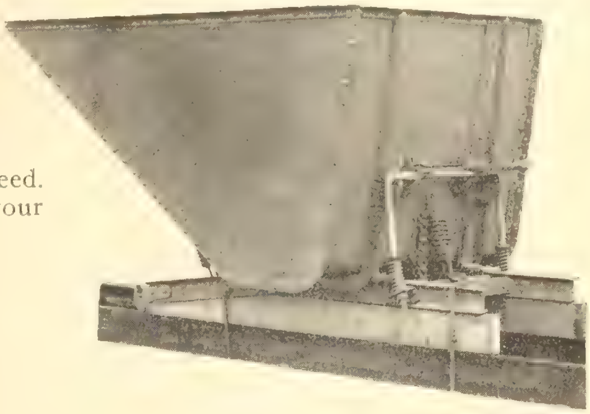

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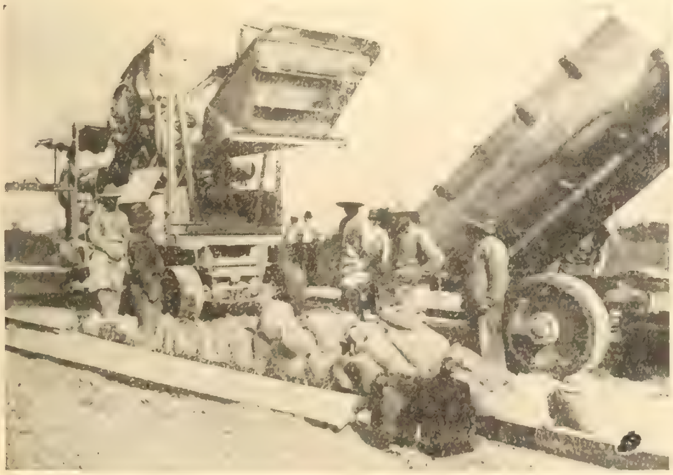

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Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	94.50	65.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	45.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	135.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	145.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.50	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	70.00
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	15.00	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	14.50
Putty in bulk	per cwt.	5.95	4.25	5.50	6.50
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.43	1.40	1.26	1.56
Raw linseed oil, in bbls.	per gal.	1.40	1.38	1.23	1.53
Turpentine, in bbls.	per gal.	1.60	2.20	2.50	2.80
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	26.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.25	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers (Common)	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Laborers (Skilled)	per hr.	.60-.70			.90
Sheet Metal Workers	per hr.	.80			

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

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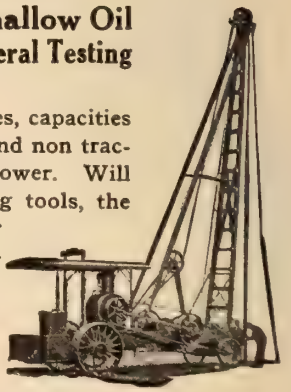

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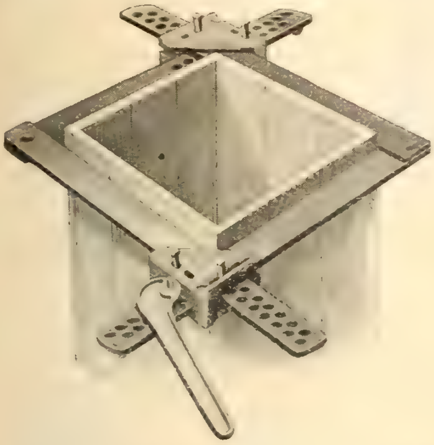

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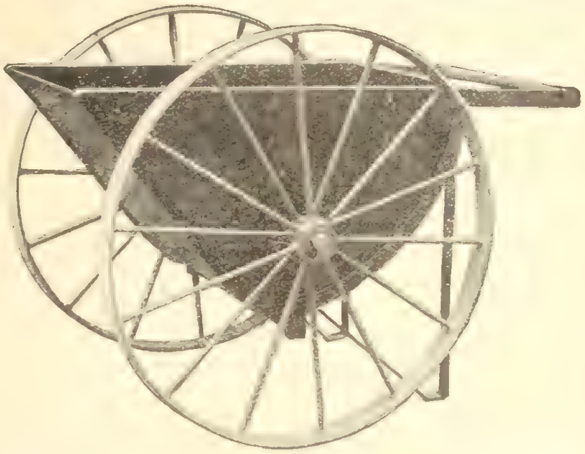

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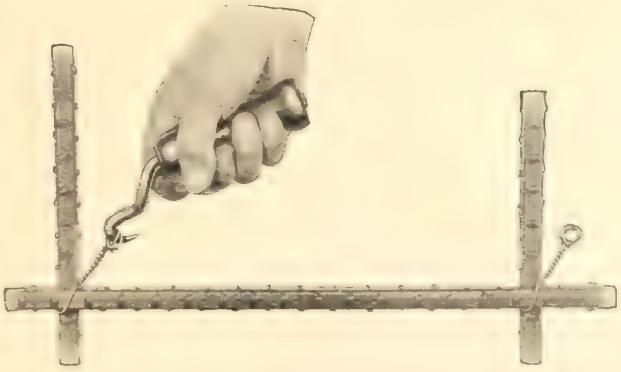

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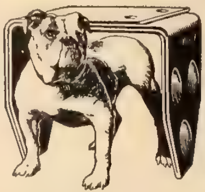

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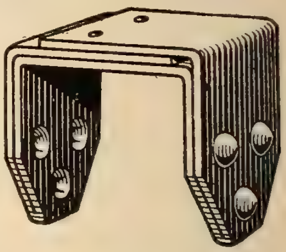

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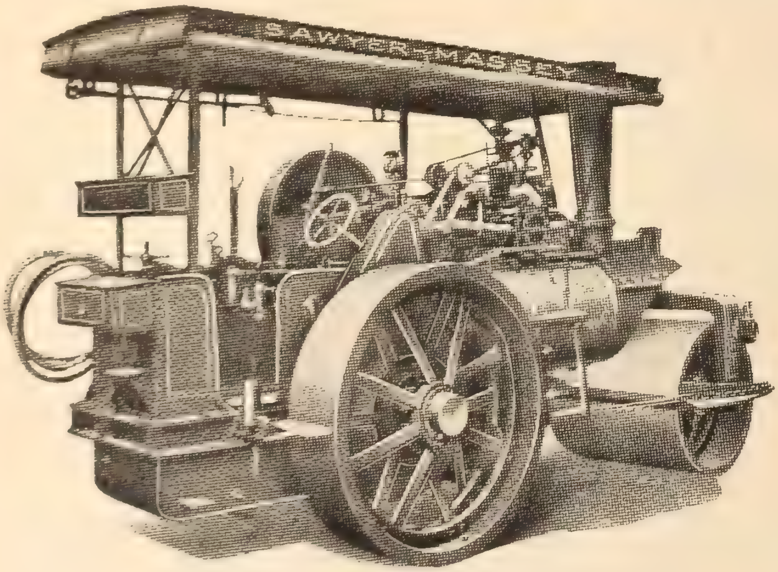

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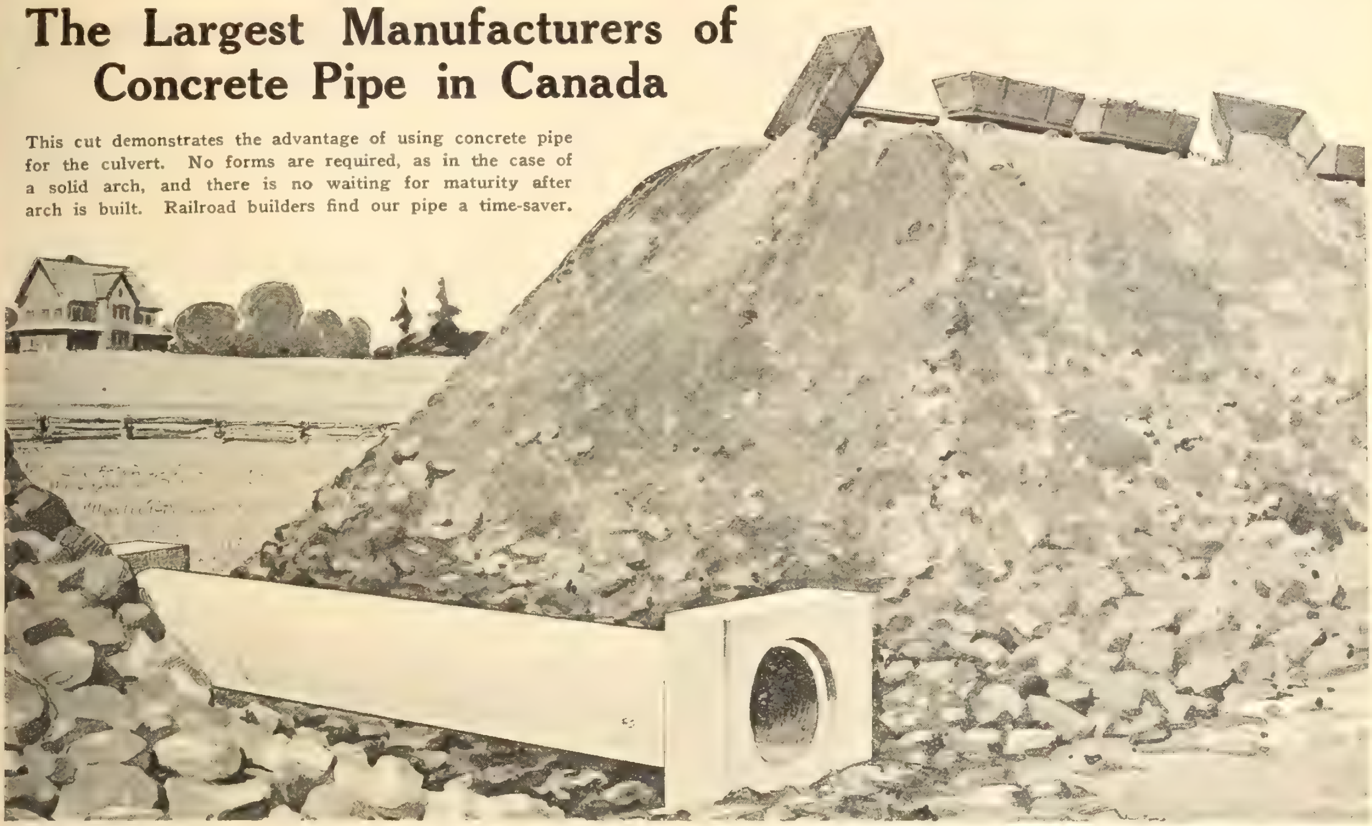

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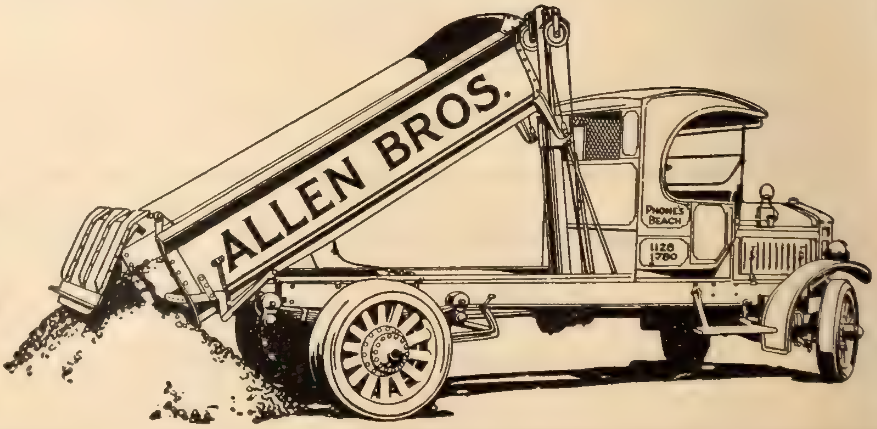

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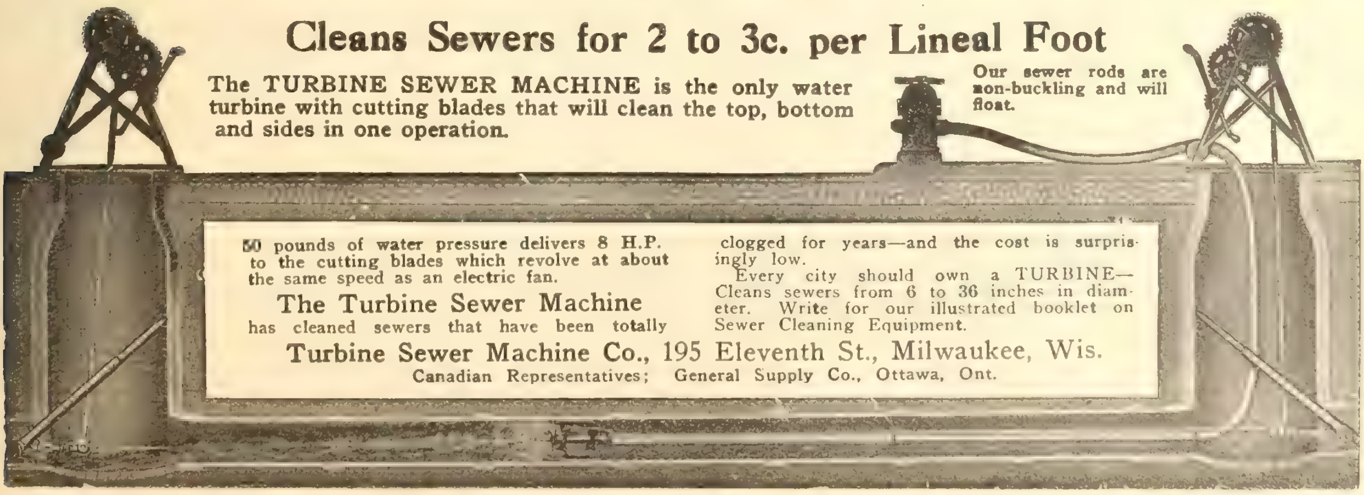

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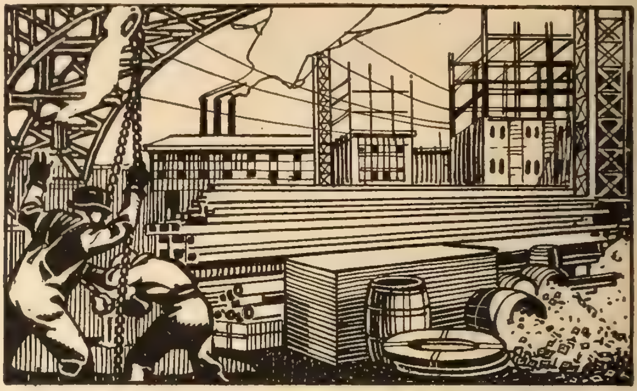

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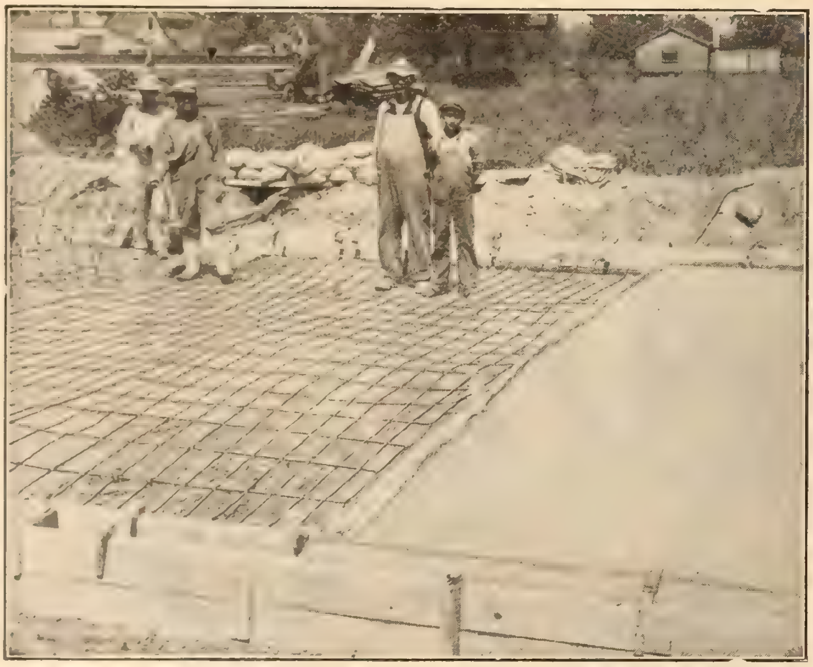

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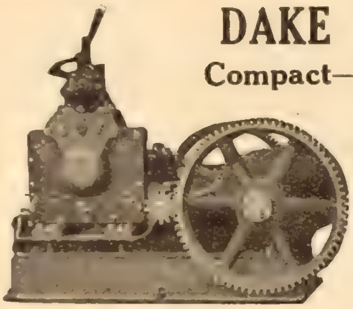

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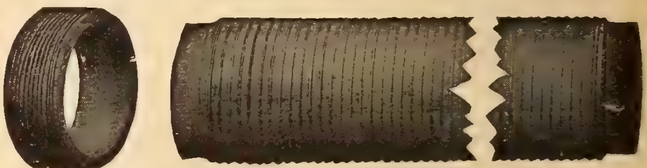

Pacific Coast Pipe Co., Ltd.
Wire Wound Wood Stave Pipe
from 2 in. to 24 in. diameter
Continuous Stave Pipe
from 16 in. to 12 ft. diameter
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for Interior Construction

Conduits Company, Limited
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Complete Electric Time Systems for Schools, Colleges, Public Institutions, Office Buildings, Factories, etc.

These comprise Master Clocks, Secondary Wall Clocks, Bell-ringing Programme Devices and Automatic Charging Cabinets. Write us for information.

International Business Machines
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"CAST IRON PIPE has the Greatest Resistance to Corrosion."

BELL and SPIGOT and FLANGED CAST IRON PIPE: SPECIALS and CASTINGS of all kinds: CAR WHEELS

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"Equipped With Turnbull Elevators"

The above phrase is frequently met with when reading the description of some fine, modern building just completed.

Many of the newest and best buildings in the cities of Ontario are equipped with "Turnbulls."

In Toronto, patrons of the Mason & Risch store are carried to the spacious showrooms in Turnbull Elevators.

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LIMITED

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Our Greatest Asset—

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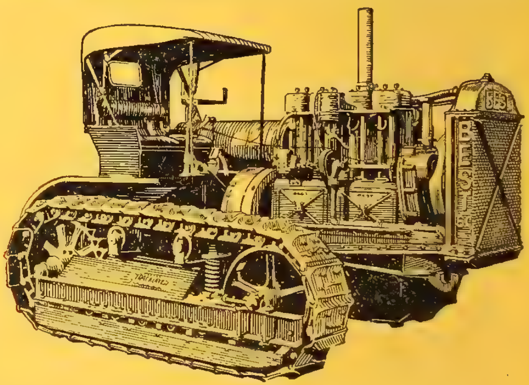

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Increase Capacity, Eliminate Vibration and Save Power

Materials and Workmanship of the Highest Grade

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Vol. 37 Toronto, July 18, 1923 No 29

Contract Record and Engineering Review

Pacific Coast Pipe Co., Limited

1551 Granville Street Established 1904 Vancouver, B. C.

The benefit
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in Wood Stave
Pipe installation
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11 ft. dia. Pipe with Special Concrete Cradles

The Combination
of Wood Stave
Pipe and
Concrete Cradles
we illustrate
here stand for
Durability
and
Economy

Wood Stave Pipe

Wire Wound Pipe
2 to 24 inches diameter

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16 inches to 14 feet diameter

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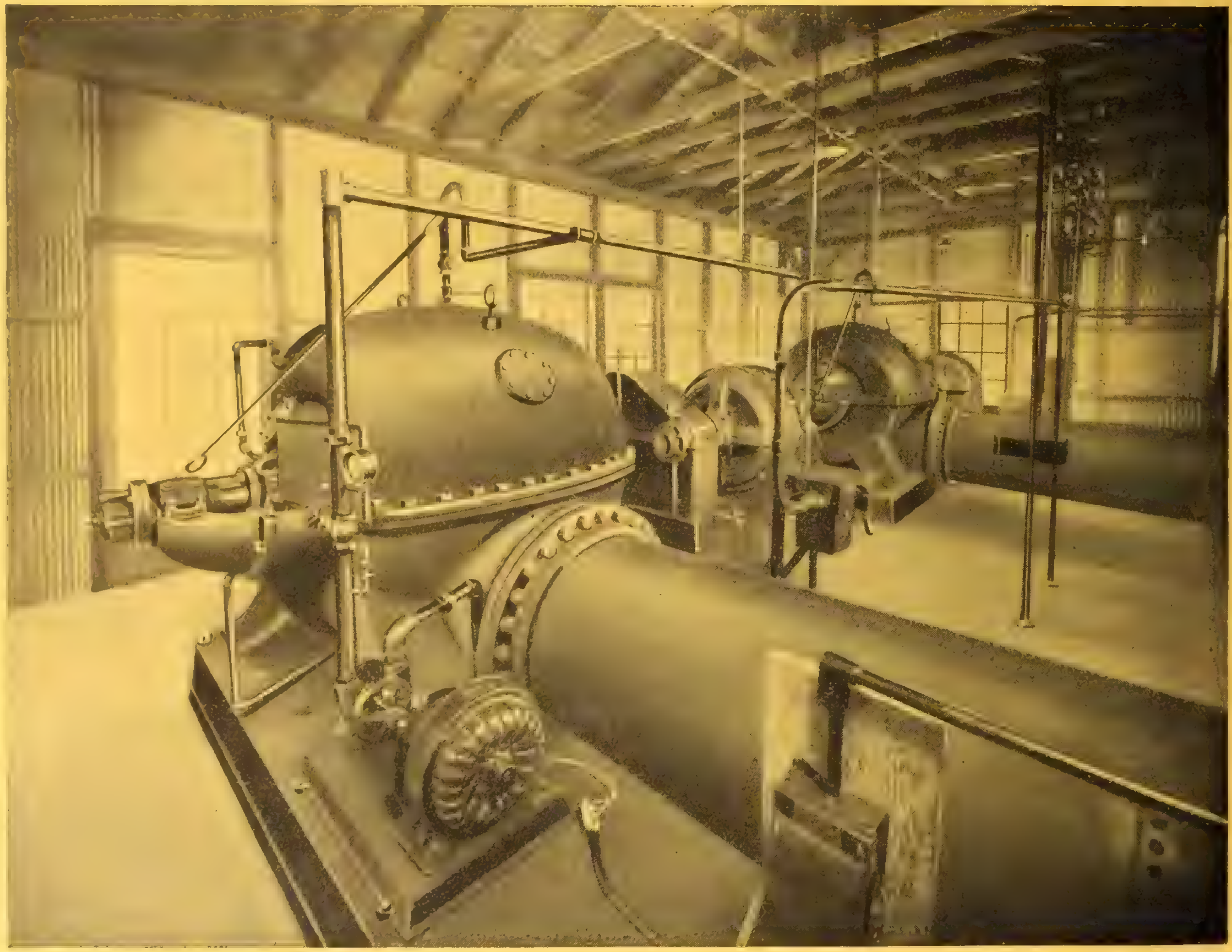
THE REES RoTURBo

A Centrifugal Pump for Any Service



Showing two 30″ Rees Roturbo Pumps, (23,000 Imp. Gals. per minute) at the Maple Ridge Dyking District

REES RoTURBo PUMPS ARE SELF REGULATING

They automatically adjust themselves to sudden Drop or Overload without injury to themselves or the prime mover, and they assure a high and constant efficiency over a wide range of duties.

Municipal and Industrial Plants all over Canada are installing REES RoTURBo PUMPS.

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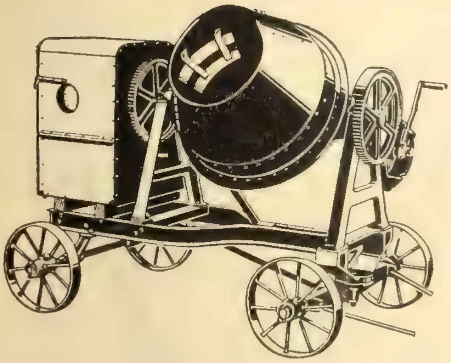
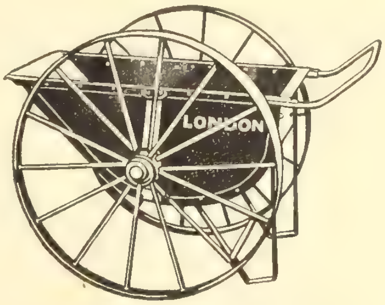


London Mixer, made in two sizes

entrusted with large contracts specify "LONDON MACHINES" not on account of the price, but because they will run continuously under the most exacting conditions.

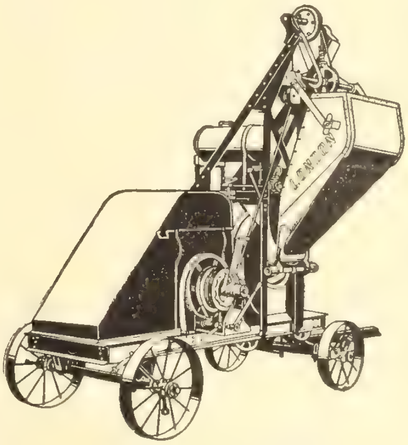


London Concrete Cart No. 6

Every machine built in our own factory under the most modern methods and sold under a guarantee of absolute satisfaction.

London Mixer. Made in three sizes

Our enormous business has been made possible by many satisfied customers. Every machine sold sells many more. This is the best guarantee possible. **"ASK THE MAN WHO USES THEM."**



London Mixer. Made in six sizes, with Steam, Gasoline or Electric Power

Made in Canada

We manufactue Concrete Mixers, Hoists, Air Compressors, Pumps, Brick, Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

The London Concrete Machinery Co., Limited

Dept. 3 London, Canada

World's Largest Manufacturers of Concrete Machinery

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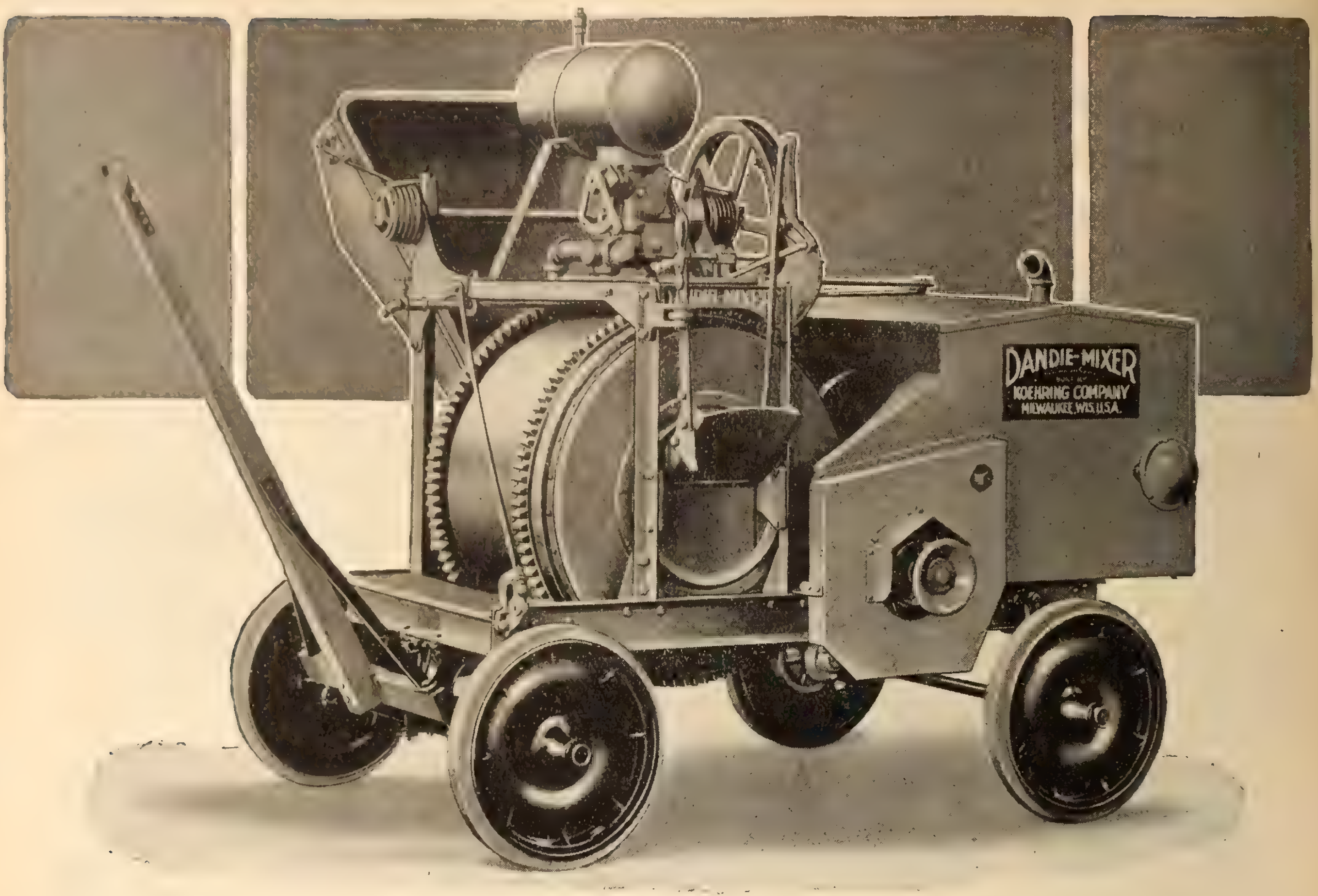


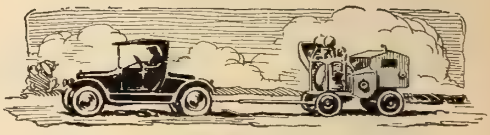
Here's your easiest profit

SAVE time moving from job to job, and use the time for putting concrete in the forms. That's turning overhead into profits.

Hitch the rubber tired Dandie behind your truck and speed from job to job. That means more jobs done per season, and a bigger working field. Where could you find an easier, surer profit?

Neither can you find a surer profit than by investing in the light mixer of utmost reliability—of greatest minute by minute capacity and longest service life.

The Koehring Dandie light mixer is the remarkable value in the light mixer field—built light, but with best Koehring construction—yet selling within the price range for light mixers.



Koehring Dandie Capacities

4 and 7 cubic feet mixed concrete. Steam and Gasoline. Power charging skip or low charging platform—automatic water-measuring tank. Discharge control from both sides. May be equipped with light duty hoist. Mixes mortar as well as uniform concrete.

Learn to judge mixer construction—send today for Koehring Dandie Catalog No.

KOEHRING COMPANY OF CANADA, LIMITED,

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616 Canada Cement Bldg., Montreal, Que.
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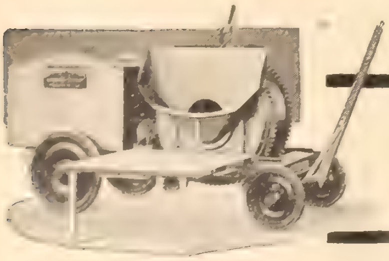
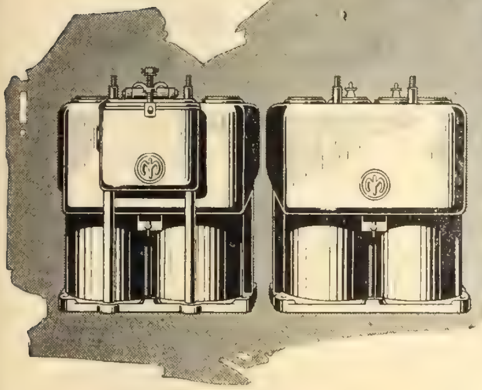


KOEHRING
DANDIE
LIGHT MIXER

Mack TRUCKS



No. 2. Cylinder Treatment

"ALL cylinder blocks are made of special semi-steel having a high graphitic carbon content.

"To avoid distortion and warping while in service they are subjected to a *heat treatment that relieves all internal stresses* set up through the uneven cooling that occurs after the castings are poured.

"When the heat-treating process is completed, the inside surface of each cylinder receives its final finish through the unusual method of *Roller Burnishing*.

"This not only produces a smoother surface than grinding but, due to the tremendous rolling pressure to which each is subjected, *the surface metal is actually changed to a more compact, wear-resisting texture.*"

MACK TRUCKS OF CANADA, LTD.
28-30 Vanauley Street, Toronto, Ontario

The 27 exclusive features listed are the result of 23 years of specializing in motor transportation. Each one has played an important part in building the reputation which Mack Trucks have established wherever motor trucks are known.

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1— Crankshaft
2— CYLINDER TREATMENT
3— Engine Support
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6— Double-Screen Oiling System
7— Water Pump
8— Exhaust Manifold
9— Intake Manifold
10— Crankcase Inspection Ports
11— Interrupted Spline Shaft
12— Reverse Gear-Shift Lever
13— Steering Wheel
14— Steering Column
15— Steel Cab Sliding Doors
16— Front Sprocket
17— Pressed Steel Radius Rod
18— Blast Cooled Dash Radiator
19— Beltless Squirrel Cage Blower
20— Single-Rod Gearshift Control
21—Non-Metallic Flexible Clutch Disc
22— Dual Reduction Drive
23— One-Piece Banjo Type Rear Axle
24— Full-Floating Construction
25— Rear Axle Accessibility
26— Drive Shaft Brake
27—Rubber (Shock Insulator) Shackles

Send for illustrated and descriptive literature on all exclusive Mack features listed above.

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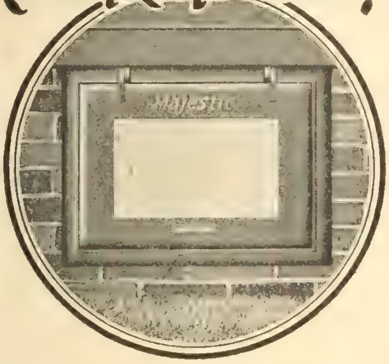
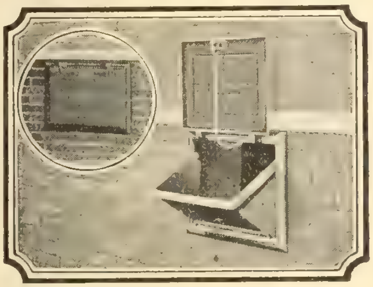


Majestic Coal Window



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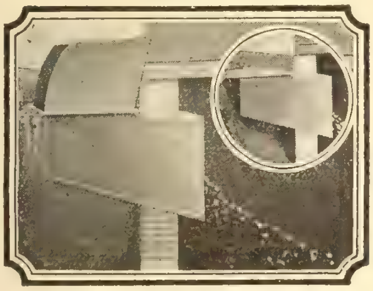
For Homes, Apartments, Etc.



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A Prophecy—

—A few years from now, every home, office building, school, and public building will be judged by the inclusion or omission of its coal window or chute. Any building without its coal window or chute will be deemed out of date.

MAJESTIC COAL WINDOWS AND CHUTES

No matter what building—home, school or other larger building, there is a Majestic design to suit. The full line is well illustrated in a booklet which you may have for the asking.

Apartment Garbage Receivers—Package Receivers, — Covered Garbage Receivers — a complete line for contractor's service.

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Galt Stove and Furnace
Company, Limited

Makers of Majestic Building Specialties

Galt - Ontario - Canada

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[illegible] Electric Co.

Elevator Doors
Ormsby Company, A. B.

Elevators
Canadian Link-Belt Co.
Jeffrey Manufacturing Co.
Otis-Fensom Elevator Co.
Turnbull Elevator Company

Enameled Brick
American Enameled Brick & Tile Company

Engines
Canadian Blower & Forge Co.
Canadian Ingersoll Rand Co.
Clyde Iron Works Sales Co.
Fuller & Johnson Mfg. Co.
Hopkins & Co., Ltd., F. H.
Inglis Co., John
Laurie & Lamb
Le Roy Company
Sterling Engine Co.
Waterous Engine Works Co.

Engines—Swinging
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.

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Chipman & Power
Hunt & Co., Robt. W.
Milton Hersey Company
Lea, R. S. & W. S.

Excavators
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Buckeye Traction Ditcher Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Engineering & Machine Works of Canada Ltd.
Erie Steam Shovel Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
Lumsden Engineering & Contracting Co.
Mussens Limited
Thew Shovel Co.

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Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Exhaust Heads
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Fans
Jeffrey Manufacturing Co.
Canadian Blower & Forge Co.

Fans, Disc
Canadian Blower & Forge Co.
Jeffrey Manufacturing Co.
Sturtevant, B. F. & Co.

Fans, Multivane
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Fans, Propeller
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Fans, Silentvane
Sturtevant, B. F. & Co.

Filters, Water
Laurie & Lamb

Fireproofing
National Fireproofing Co.

Fireproof Doors and Windows
Fireproof Door Company, Ltd.
Mussens Limited
Ormsby Company, A. B.

Fire Escapes
Canadian Des Moines Steel Co.
McGregor & McIntyre

Fittings
Crane Limited
H. Mueller Mfg. Co., Limited
York Manufacturing Co.

Fixing Devices
[illegible] Limited
Rawplug Co., of Canada

Flag Poles
MacKinnon Steel Company
McGregor & McIntyre

Floor Clips
Western Steel Products Limited

Floor Stands
Jenkins Bros. Ltd.

Flooring Materials
Carmichael Ltd., A. W.
Imperial Oil Company, Ltd.
National Fireproofing Co.
Vitrified Clay Pipe Publicity Bureau

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Canadian Blower & Forge Co.

Furnaces
H. Mueller Mfg. Co., Limited

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Orton & Steinbrenner Co.

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London Concrete Machry. Co.

Gears (Cut)
Hamilton Gear & Machine Co.

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Brantford Sand & Gravel Co.
Paris Sand & Gravel Co.
Rogers Supply Co.

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Canadian Ingersoll-Rand Co.

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Hardware Co., of Toronto
Mercer Bros.

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Eaton & Sons, J. R.

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Lumsden Engineering & Transport Co.

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Crane, Limited
Sturtevant, B. F. & Co.

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Canadian Link-Belt Co.
Clyde Iron Works Sales Co.

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Dominion Truck Equipment Co.
Wood Hydraulic Hoist & Body Co., Ltd.

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Canadian Austin Machinery
Canadian Ingersoll Rand Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Hopkins & Co., Ltd., F. H.
Industrial Works
London Concrete Machry. Co.
Mussens Limited
Watson Jack & Co.

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Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
General Products Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
London Concrete Machry. Co.
McGovern, T. J.
Mussens Limited
Turnbull & Co., Harvard

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Canada Iron Foundries
Dominion Steel Products Ltd.
Kerr Engine Company
Gartshore-Thompson Pipe Co.
McAvity & Sons, T.
Hepburn, Ltd., John T.

Hydrated Lime
Melville Quarry Co.
Muldoon, Ltd., J.
Standard Lime Co.

Ice Making Machinery
Canadian Ingersoll Rand Co.
York Manufacturing Co.

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Canadian Austin Machinery
Canadian Equipment Co.
Hopkins & Co., Ltd., F. H.
MacKinnon Steel Company
Mussens Limited

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Canadian Inspection & Testing Laboratories
Hunt & Co., Robt. W.
Milton Hersey Company

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Imperial Oil Company, Ltd.
Spielman Agencies Regd.
Standard Underground Cable Co., of Canada Ltd.

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Hamilton Bridge Works Co.

Joist Hangers
Hamilton Bridge Works Co.

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Canadian Blower & Forge Co.
MacKinnon Steel Company

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American Lead Pencil Co.

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Standard Lime Co.
Muldoon, Ltd., J.

Hydrated Lime
Standard White Lime Co.

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Canada Wire & Iron Goods Co.

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Ball Engine Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Link-Belt Co.
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General Products Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
McGovern, T. J.
Mussens Limited
Orton & Steinbrenner Co.

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Canadian Equipment Co.

Locomotive Gasoline and Storage Battery
Canadian Austin Machinery
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F. H. Hopkins & Co., Ltd.
Jeffrey Manufacturing Co.
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General Products Co.
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Meters
Builders Iron Foundry

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Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
MacKinnon Steel Company

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Dennis Wire & Iron Works Co.
Canada Wire & Irons Goods Co.

Ornamental Moulds
London Concrete Machry. Co.

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Hopkins & Co., Ltd., F. H.
Spielman Agencies Regd.

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Canada Paint Co.
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.

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Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Lumsden Engineering & Contracting Co.
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American Lead Pencil Co.

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Hamilton Bridge Works Co.
Pacific Coast Pipe Co.

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Greening Wire Co., B.

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Canadian Ingersoll-Rand Co.
Canadian Mead-Morrison Co.
Clyde Iron Works
Hopkins & Co., Ltd., F. H.
Mussens Limited

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Canadian Pipe Co.
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Gartshore, Thompson Pipe Co.
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Mussens Limited

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Canadian Johns-Manville Co.

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Gartshore, John J.
Hopkins & Co., Ltd., F. H.
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(Continued on page 10)

"MEAD-MORRISON"

CAR PULLERS

Get along without the switching locomotive and shift your cars at *your* convenience. The wages of one man will pay for this machine in a few months.

Capacity 7,500 and 10,000 lbs. Shipment from stock.

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Made in Canada

CANADIAN MEAD-MORRISON CO
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CANADA CEMENT BUILDING
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- Greening Wire Co., B.

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- Bates Valve Bag Co.

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- York Manufacturing Co.

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- Imperial Oil Company, Ltd.

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- Barrett Company, Ltd.
- Dom. Tar & Chemical Co., Ltd.

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Roofing Cement
- Barrett Company, Ltd.
- Dom. Tar & Chemical Co., Ltd.

Roofing Material
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- Queenston Quarries Co.

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- Muldoon, Ltd., J.
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- Turbine Sewer Machine Co.

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- Muldoon, Ltd., J.
- National Iron Works
- Vitrified Clay Pipe Publicity Bureau

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Shingle Stain Oil
- Barrett Company, Ltd.
- Dom. Tar & Chemical Co., Ltd.

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- Ball Engine Co.
- Canadian Austin Machinery
- Canadian Equipment Co.
- Canadian Mead-Morrison Co.
- Erie Steam Shovel Co.
- Hopkins & Co., Ltd., F. H.
- McGovern, T. J.
- Mussens Limited
- Osgood Company
- Thew Shovel Co.

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- McGregor & McIntyre

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- National Fireproofing Co.

Silo Moulds
- London Concrete Machry. Co.

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- Hamilton Bridge Works Co.
- MacKinnon Steel Company
- McGregor & McIntyre
- Standard Steel Construction Co
- Waterous Engine Works Co.

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- Canadian Equipment Co.
- F. H. Hopkins & Co., Ltd.
- Mussens Limited

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- Canadian Des Moines Steel Co.

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- Canada Wire & Iron Goods Co.
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- Canadian Ingersoll Rand Co.
- McAvity & Sons, Ltd., T.

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- British Empire Steel Corporation
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Steel Curb Forms
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- Horton Steel Works, Ltd.
- National Equipment Company

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- Canadian Blower & Forge Co.
- Canadian Des Moines Steel Co.
- Hamilton Bridge Works Co.
- Horton Steel Works, Ltd.
- MacKinnon Steel Company
- Standard Steel Construction Co.
- Sturtevant, B. F. & Co.
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- Heltzel Steel Form & Iron Co.

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- Ormsby Company, A. B.
- Can. Metal Window & Steel Products

Steel Sidewalk Forms
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- Greening Wire Co., B.
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Stove Surfacing Machinery
- Canadian Ingersoll Rand Co.

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- Canadian Ingersoll Rand Co.

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- Burlington Steel Company
- Canadian Des Moines Steel Co.
- Hagarty, R. E. W.
- Hamilton Bridge Works Co.
- Horton Steel Works, Ltd.
- McGregor & McIntyre
- MacKinnon Steel Company
- Reid & Brown Structural Steel & Iron Works
- Sarnia Bridge Company
- Standard Steel Construction Co.

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- Dake Engine Co.

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- Canadian Welding Works
- Canadian Des Moines Steel Co.
- Hamilton Bridge Works Co.
- Inglis Co., John
- McGregor & McIntyre
- Waterous Engine Co.

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- Canadian Pipe Company
- Vancouver Wood Pipe and Tank Company
- Pacific Coast Pipe Co.
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- Leckie Co., John

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- Hunt & Company, Robt. W.
- Milton Hersey Company

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- Erie Clay Products Ltd.
- General Products Co.
- Italian Mosaic & Tile Co.

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- London Concrete Machry. Co.

Tile Drain
- Erie Clay Products Ltd.
- National Fireproofing Co.

Tile Hollow
- National Fireproofing Co.

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- International Business Machines

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- Canadian Des Moines Steel Co.
- Hamilton Bridge Works Co.
- Horton Steel Works, Ltd.
- Standard Steel Construction Co

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- Baker Mfg. Co.
- Holt Manufacturing Co.
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- Mussens Limited

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- Holt Manufacturing Co.

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- Commercial Cars of Canada
- Federal Motor Truck Co.
- Holt Manufacturing Co.
- Jones Motors Ltd.
- Leyland Motors
- Packard Ontario Motor Co.
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- Canada Machinery Corporation

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Concrete Block Buiding as it appeared 20 minutes after fire was lighted. Water being applied

Appearance of Concrete Block Building after fire was completely extinguished

CANADA CEMENT
CONCRETE
FOR PERMANENCE

Concrete Materials Put to a Supreme Fire Test

An interesting demonstration of fire-proof home construction was arranged by the Concrete Products Association of Minnesota.

A house was built of Concrete Block, with Cement Stucco surface, Cement Asbestos Shingles, and Concrete Sills and Lintels.

This building, filled with highly inflammable material, was set on fire, and the fire permitted to rage thirty minutes.

Although the fire was extinguished by a heavy stream of cold water applied to the intensely hot walls, close inspection of the interior disclosed the fact that not a single crack was in evidence in either the Block, or Concrete Sills and Lintels. The only parts of the building damaged at all were the Doors and Window Frames of wood.

This test, and its remarkable result, serves to emphasize the sound structural qualities of Concrete Block Stuccoed. The Concrete Block gives strength and permanence. The Stucco lends beauty and charm, in addition to being weather-proof, fire-proof and rot-proof.

When it is considered that the walls of this fire-tested dwelling were only ten days old, and the Stucco and Plaster only three days old, the results of the demonstration are truly significant.

Specify
CANADA CEMENT
Uniformly Reliable

We maintain a Service Department to co-operate in all lines of work for which Concrete is adapted. Our library is comprehensive and is at your disposal at all times without charge.

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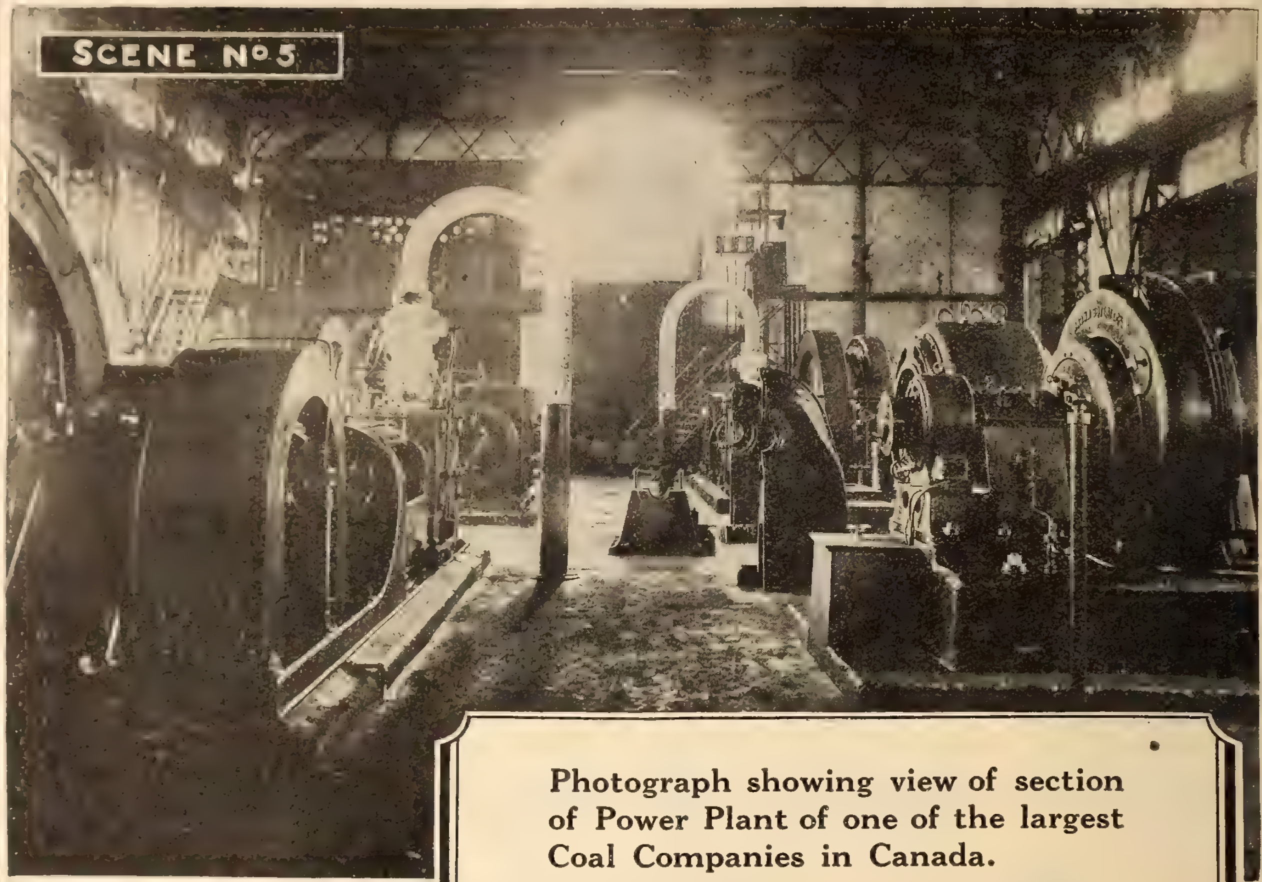

Photograph showing view of section of Power Plant of one of the largest Coal Companies in Canada.

All lubricants in use in this plant are supplied by Imperial Oil Limited.

IMPERIAL
LUBRICANTS

FOR MANUFACTURING, MINING AND MILLING

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Imperial Greases.

Imperial Lubricants are speeding up production and cutting down operating costs in practically every line of Canadian industry. Engineers all over the country specify these oils for the most exacting lubrication jobs because they know their long-time record for satisfaction and dependability.

There's an Imperial Lubricant suitable for every plant requirement. The service of an expert lubrication engineer is available on request at our nearest branch.

IMPERIAL OIL LIMITED

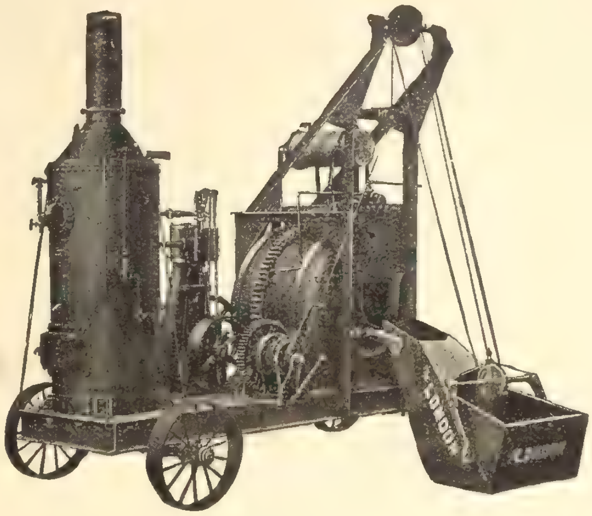
A LONDON MIXER

soon pays for itself in increased production and lower operating costs.

Whatever your requirements, there is a London machine that will exactly meet them.

Supplied with gasoline, steam or electric power.

Information and prices gladly furnished on request.



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RAILWAY, MARINE AND CONTRACTORS SUPPLIES
EXCELSIOR LIFE BLDG., TORONTO ST.
TORONTO

Representatives for:
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Select your requirements
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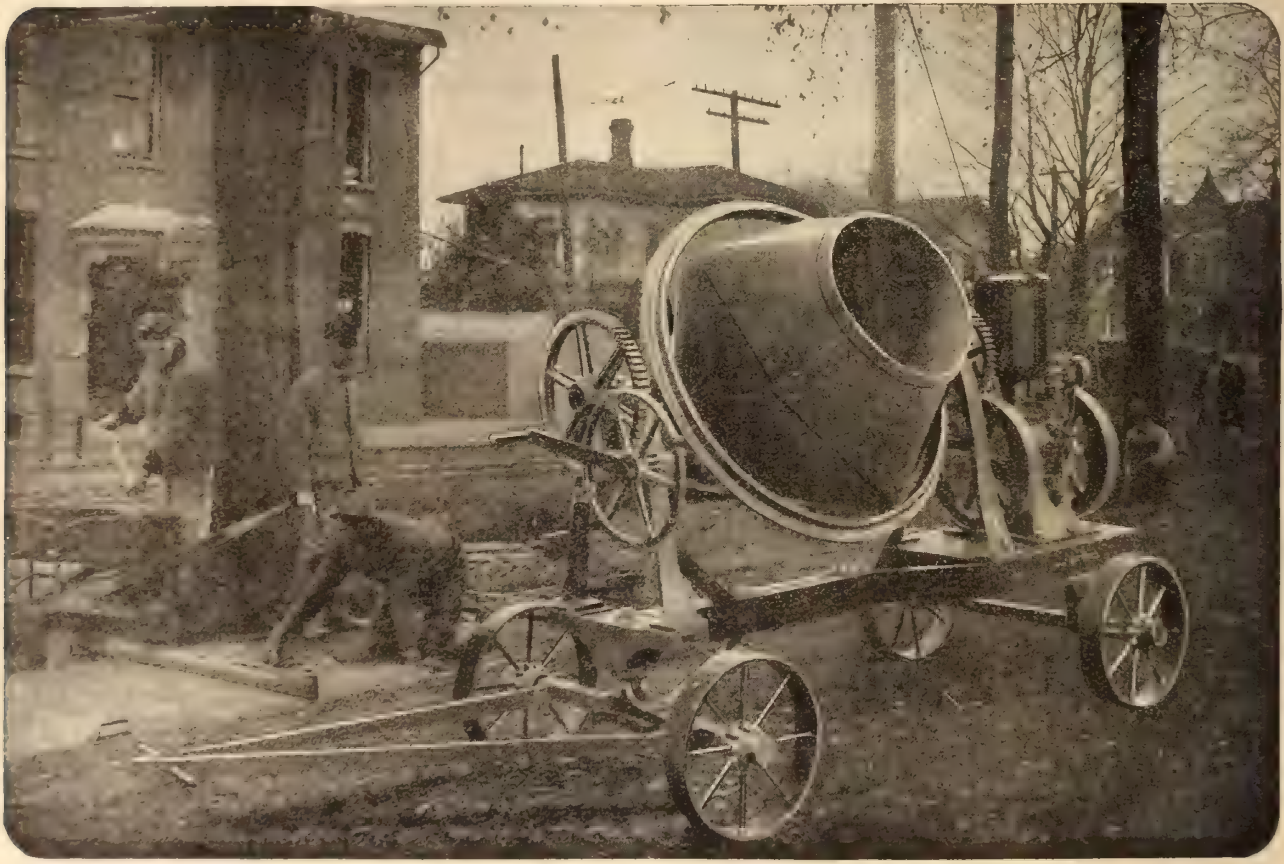
"MOVES THE EARTH—MIXES THE CONCRETE"
TRADE MARK

The CUB-HEX

A LIGHT-TYPE PORTABLE CONCRETE MIXER



THE PROFITABLE MIXER FOR THE SMALL JOBS

Ordinary foundations, sidewalks, curbs, gutters, silos, tanks, culverts, floors and similar work not requiring the greater capacity of the larger size mixers can be more profitably handled by means of the "CUB HEX."

Its greater speed and the perfect mix, possible only with the famous Austin Cube principle, will save the contractor many dollars on the smaller jobs.

Its output of perfectly mixed concrete, or mortar cannot be equalled by any other type of mixer, and it has honestly earned its reputation as the GREATEST UTILITY MIXER ever produced

Illustration shows engine exposed, standard equipment is supplied with sheet metal housing entirely enclosing same.

Write us for descriptive literature, prices, etc.

CANADIAN AUSTIN MACHINERY LIMITED

WOODSTOCK, ONT.

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Ontario: Dominion Industrial Products Co. Ltd., Toronto.
Quebec: M. W. Davidson, Montreal.
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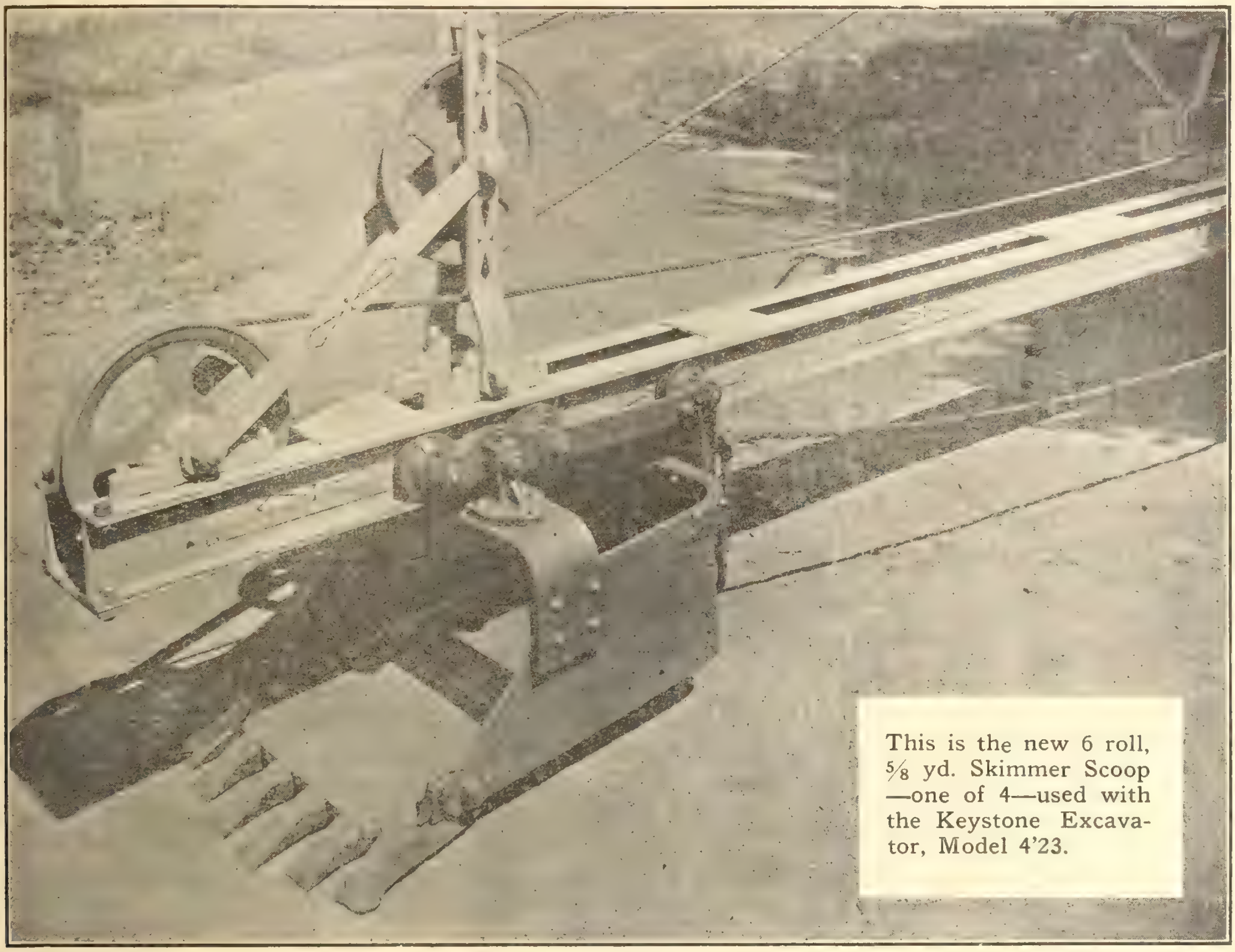


This is the new 6 roll, ⅝ yd. Skimmer Scoop —one of 4—used with the Keystone Excavator, Model 4'23.

A Good Healthy Punch in this Scoop

Backed by the 32 h.p. strength of its engine this Keystone Excavator Skimmer Scoop can rip its way into any kind of material, including old asphalt and macadam and generally scoops out its ⅝ yard with one thrust. For road making or shallow excavating of from say 8 feet down to 6 inches you can't beat the Keystone—travels under its own power, goes anywhere you want a dump wagon to go. Crew of three men can handle up to 500 cu. yds. per day.

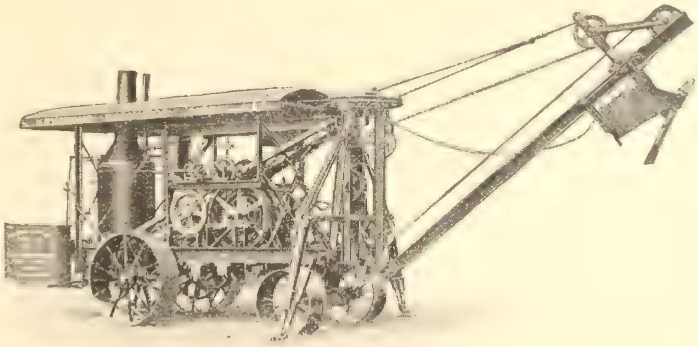
"Good Investment for any Contractor"

In answer to your inquiry, I beg to say that I have been using a Keystone Excavator Model 4 for the last two years for street grading purposes, and that I am very much satisfied with the work done by the machine, and with the services received from you in connection with the providing of repair parts.

The Keystone Excavator is a very handy Machine that can be operated at a very low cost, and the purchase of said Machine, in my opinion, is a good investment for any contractor doing road work.

(Sgd.) BERNARD BRAULT,
Montreal.

The Keystone is built entirely in Canada and is sold at a moderate price. Let us send you a new descriptive folder just off the press.



Engineering & Machine Works of Canada, Ltd.

ST. CATHARINES, ONT.

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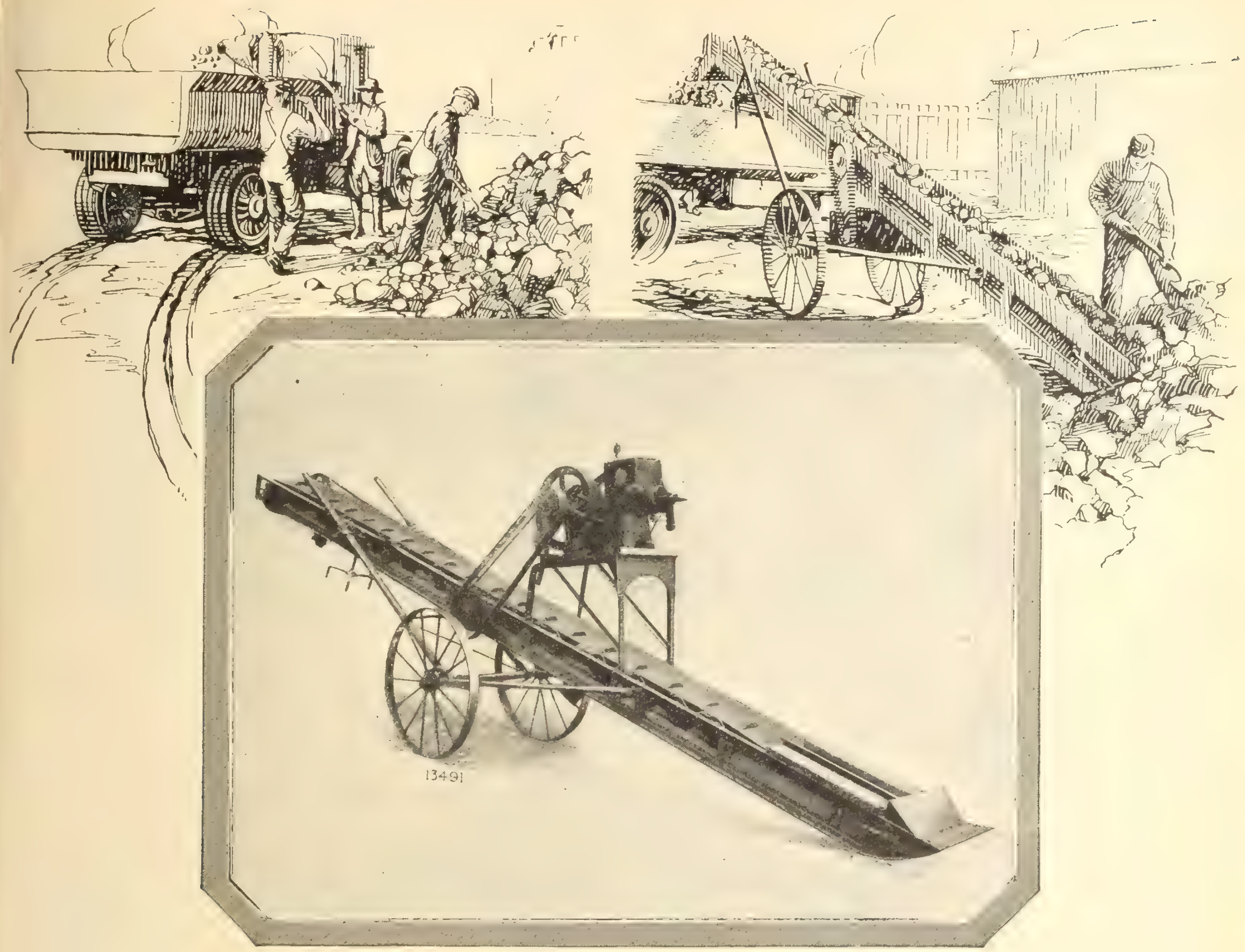

One Man Against Three

One man and a Jeffrey "Portable" can load a 5-ton truck in ten minutes. Doing this work by hand takes 3 men 40 minutes. Figuring then the cost of labor at 40c. per hour, the conveyor will load at a cost of 2c. per ton against 16c. per ton by hand, or an average saving of 14c. on each ton loaded.

Isn't this worth your investigation?

Rugged design, sturdy construction, ease and economy of operation, fully qualify the Jeffrey Portable Belt Conveyor to completely meet at low cost, the loading or unloading requirements of Contractors, Quarries, Industrial Plants, Coal and Building Supply Yards, etc.

Write for further information and prices.

Jeffrey Labor-Aiding Equipment includes a complete line of Portable Bucket Loaders; Portable Belt Conveyors; Elevating and Conveying Machinery for handling all kinds of raw and finished materials; Chains; Sprockets; Coal and Ashes Handling Equipments; Skip Hoists; Crushers; Pulverizers; Shredders; Industrial and Mine Locomotives; Coal Mining and Tipple Machinery Equipment, etc.

The Jeffrey Mfg. Co., Canadian Branch and Warerooms, Montreal

JEFFREY

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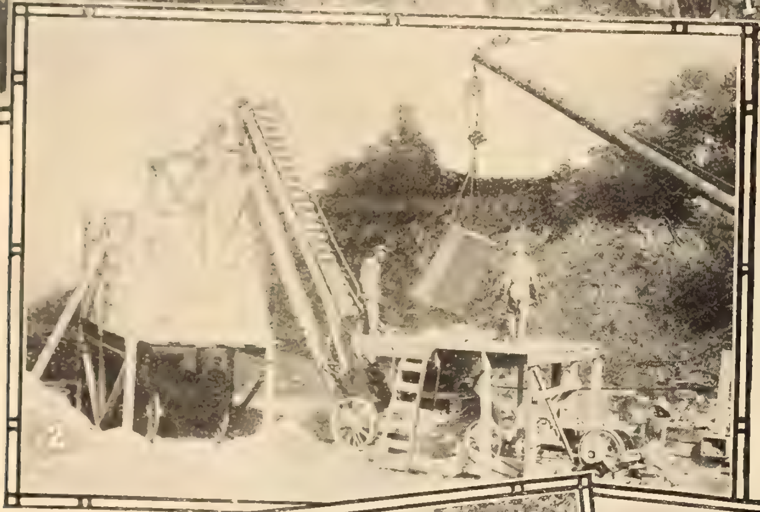

2

TELSMITH MOUNTED BREAKERS

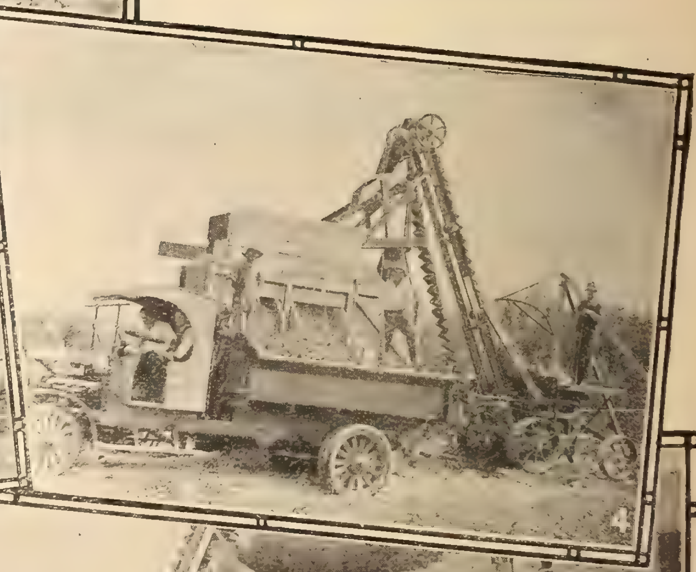
Because of its cubical (not slabby) product, the Telsmith Mounted Breaker is widely used in road construction in Canada, the United States, Cuba, Porto Rico, Hawaii and Philippine Islands. Plates 1, 3 and 4 show the No. 3 size, with two 7-in. x 37-in. feed openings, and an output of 10 - 15 cu. yds., hourly at a power consumption of 20 H.P. Plate 2 shows the No. 5 size—the biggest portable crushing plant built—with two 10-in. x 48-in. feed openings, an hourly output of 25 - 35 cu. yds. at a power consumption of 30-35 H.P. Plate 5 shows a No. 4 outfit, midway between the No. 3 and No. 5 in capacity and power requirements.

Write for Bulletins.

Canadian Ingersoll-Rand Co., Limited
Sydney, Sherbrooke, Montreal, Toronto,
Cobalt, Winnipeg, Nelson, Vancouver.

Ingersoll-Rand

3

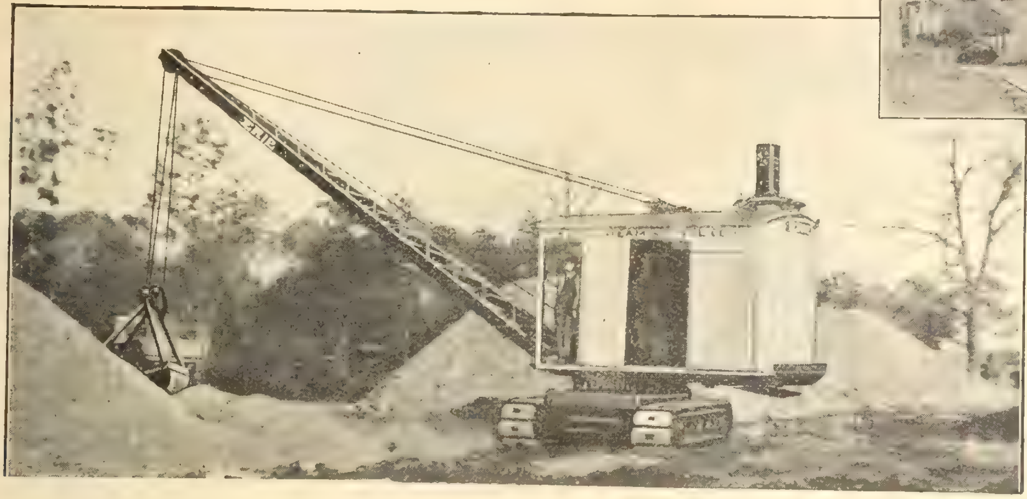

4

5

Most sections have only 150 to 200 days a year of good weather suitable for outside work.

Use the Shovel that WORKS EVERY GOOD DAY

ON HEAVY RAILROAD GRADING: One of the 7 Eries owned by the Sutton Construction Co., Ashland, Ky.



HANDLING CONCRETE AGGREGATES: Another of the Sutton Construction Company's 7 Eries, working as a locomotive crane, and equipped with the Erie lubricated caterpillar type mounting.

25 YEARS of shovel and crane service with only 5 days lost time

When you have an ERIE "Delays are unknown"

"After my eperience with different steam shovels and cranes as County Engineer of Chautauqua County, N.Y., I would not have anything but an Erie. Delays are unknown with an Erie, and upkeep is practically nothing, In 3½ months our Erie Crane unloaded 13,000 cu. yds. of gravel, and could have doubled this if required."— **Wm. J. Knauer, Hitchcock & Knauer, Jamestown, N. Y.**

"The Erie Shovel is far superior to other shovels in every way—there is no other shovel that can equal it for reliable service and low upkeep cost. Grading streets 3 in. to 3 ft. deep, our Erie gives an output of 250 to 450 cu. yds. per 8-hour day."—**R. C. Myers, Strange-Maguire Co., Salt Lake City, Utah. (Own 2 Eries.)**

"The Erie is by far the best shovel we have ever used. We own two other shovels of different make, and find the Erie does more work, and is much less expensive to keep up."— **Geo. M. Norwood Brick Co., Raleigh, N. C.**

How many days of good weather can you count on in a season? And how many of these days can you afford to lose because of machinery breakdowns?

It pays to use the equipment that is most

RELIABLE

This will seem impossible to the contractor who has not yet used Erie Shovels, and does not know the Erie's reliability from **actual experience.** "What!"— you can hear him say— "Operate 6 steam shovels and cranes, over a period of six years— **with a total of 25 service years**— and have only 5 days', total lost time on account of breakdowns? No machines that I have used can do anything like it!"

But Erie Shovels ARE doing it— many Eries have made records like this. The following letter is not an unusual case; it represents the kind of service that hundreds of Erie owners are getting:

"In our six years of experience with Eries, we have not lost more than five days altogether on account of breakdowns. Although most of our work has been heavy and difficult excavation, repair cost has been mighty low. For durability and service the Erie **is in a class by itself**— and we have seen all makes of shovels, and obtained all possible information about them."— **W. D. Sutton, Pres., Sutton Construction Co., Ashland, Ky.**

(They have just bought another Erie and now own 7— and altogether have had between 25 and 30 sevice years with Eries.)

Many carefully checked upkeep records, kept by contractors who have used different makes of shovels, show that their Eries have cost only about ⅓ as much for repairs. **Even more important than the saving in actual upkeep, is the SAVING IN WORKING TIME.**

At the left are a few of the hundreds of letters in our files—giving exactly the same facts that contractors will give you when you make personal inquiries.

If you believe that it is most important to get excavating equipment that is RELIABLE, that you can depend on— **then you want an Erie.**

ERIE STEAM SHOVEL CO., ERIE PA., U. S. A.

Incorporated 1883: formerly BALL ENGINE CO.

Builders of ERIE Steam Shovels, Locomotive Cranes, Railway Ditchers

ERIE Revolving Shovels

The Heart of Our Roofing is Sound—

THE COMPLETE QUALITY ROOFING LINE

TORONTO ASPHALT SLATES
"They will not curl."
Red or Green or Heather.

TORONTO ROLL ROOFINGS
"Better-made for best Service."

Slate Surface in Rolls
Redroc or Greenroc or Heather.

Heavy Quality.
Both sides finished with fine silica.
In various weights.

Milenite Smooth
Both sides finished smooth with fine talc.
In various weights.

Special Service
Fine silica one side, other side finished with fine talc.
In various weights.

SUPERIOR ASPHALT FELT
The "Permanent" Sheathing.
Wind and weather proof. Does not deteriorate with age.
In various weights.

"BUILT-UP" ROOF
For Flat Roof Buildings.

NORTHSIDE SHEATHING
For wind proofing the house.
Excellent insulator and sound deadener.

Write us for Samples and Prices

TORONTO
ASPHALT
ROOFING

Two men—both of them much alike in appearance yet in their ability to give service, widely different. Roofing, too, may look as much alike as these two men, yet the proof of their service is endurance.

Toronto Asphalt Roofing is sound in structure—and therefore **will** endure and **will** give permanent service and satisfaction—because

1. Only the finest materials are used—pure asphalt of heavy body and all-rag felt carrying a high percentage of wool.
2. It is manufactured under the Milne System with one thought uppermost—Quality.

Toronto Asphalt Roofings are economical—easy to lay, require no painting to keep them in condition. They will give prolonged service—beyond your expectation.

"Toronto Asphalt Roofings cost more because they are worth more but they are worth more than they cost."

For full particulars and prices write—

Toronto Asphalt Roofing Mfg. Co., Limited
Mount Dennis Ontario

MUSSENS M LIMITED

Burch Stone Spreaders

YOU CAN LOWER YOUR COSTS

If you have

BURCH STONE SPREADERS

ON THE JOB

Spread to any depth and to any width from 8 feet to 16 feet.

MADE IN CANADA

Ask for Particulars

Burch Stone Spreader with wings

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

MUSSENS M LIMITED

IN STOCK

Quick Shipment of MARSH HOISTS

Following sizes in Montreal stock:-

5 x 7 Double Cylinder, Single Drum, with Boiler.
6½ x 8 Double Cylinder, Double Drum, with Boiler.
6¾ x 10 Double Cylinder, Double Drum, with Boiler.
7 x 12 Double Cylinder, Double Drum, with Boiler.
6 Horse Power, Double Drum, Gasoline Hoist.

Following sizes in Winnipeg stock:-

5 x 7 Double Cylinder, Single Drum, Reversible Builder's Hoist with boiler.
6½ x 8 Swinger, with bull ring and guide sheaves.
7 x 12 Swinger, with bull ring and guide sheaves.

Boilers will pass inspection for any Province.
All machines guaranteed.

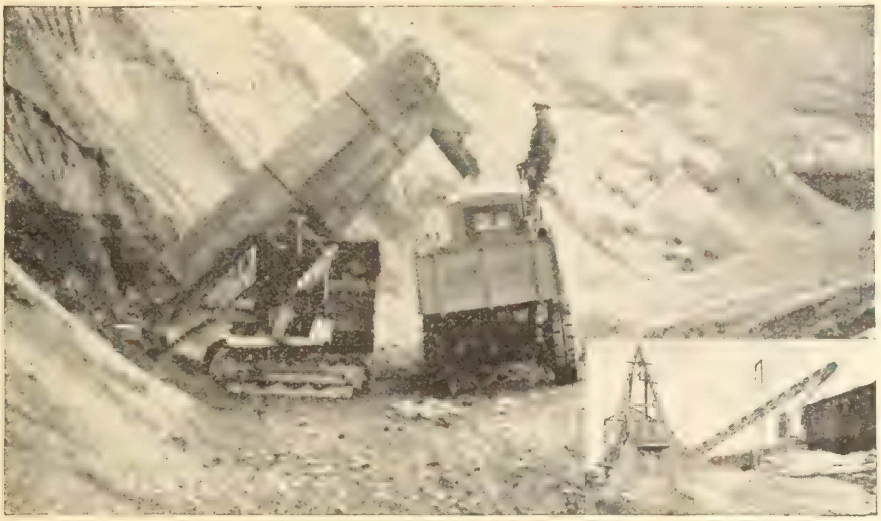
If you need a special hoist we can build it for you. Also, Derrick Irons, Car Wheels, Cars, Buckets, Skips, etc.

Send us your enquiries for all classes of Excavating and Construction Machinery and Supplies.

MUSSENS LIMITED

Montreal Toronto
Winnipeg Vancouver

MUSSENS M LIMITED



Barber-Greene Bucket Loader owned by B. D. Hyde, New York, and Barber-Greene Conveyor owned by R. C. Products Trust, Cleveland

Delivery Now as Important as Cost

Common labor is getting scarcer and dearer so rapidly that keeping up with deliveries will soon be quite as important as keeping down costs has been.

Because of the increasing realization of this fact many who put off buying Barber-Greene material handling equipment while its principal advantage was a reduction of handling cost are now buying it in order to make sure of maintaining output.

With Barber-Greene conveyors and bucket loaders you can handle more material with fewer men.

The Moore Construction Company, of Nashville, Tennessee, reduced its overhead charge per yard by 66%, and in addition saved 25 men in loading gravel direct from bank to trucks.

The Oakland Building Material Company, of Oakland, California, uses a Barber-Greene Bucket Loader to make the most of the eight-hour day. With it they made a record of handling 105 five-yard truck loads on December 15. Significant, too, is the fact that the one Barber-Greene replaced two loaders of another design and type.

The R. C. Products Trust, of Cleveland, uses a Barber-Greene Conveyor to replace a locomotive crane in loading beach sand, because the Barber-Greene reaches 30 feet farther than a crane and saves men and money.

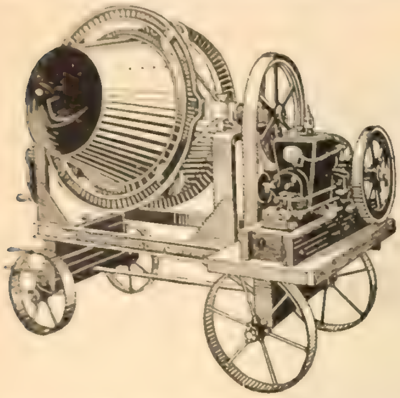
Send for our N catalog and our certified cost reports giving the experience of users.

B
STANDARDIZED
MATERIAL HANDLING
MACHINES
G

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

You'll Finish the Job Faster With Fewer Men if you get a WETTLAUFER Mixer



THE WETTLAUFER O-POWER MIXER

is the mixer that makes small jobs pay. This 5 cub. ft. machine mixes mortar, plaster and concrete. Can be supplied with handy hoisting attachment. Three machines in one. An all-steel job—light, yet lasting, Every contractor needs one. Write for folder No. 149.

There is a type and size of Wettlaufer Mixer to suit the needs of every job and every contractor. Known all over the world for simplicity, strength, speed and service.

WETTLAUFER MIXERS

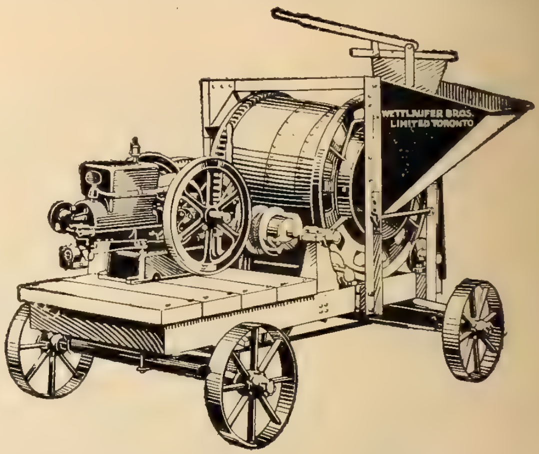
are equipped with

HEART-SHAPED DRUMS

which give better mixing, faster mixing, and quicker discharge, and with

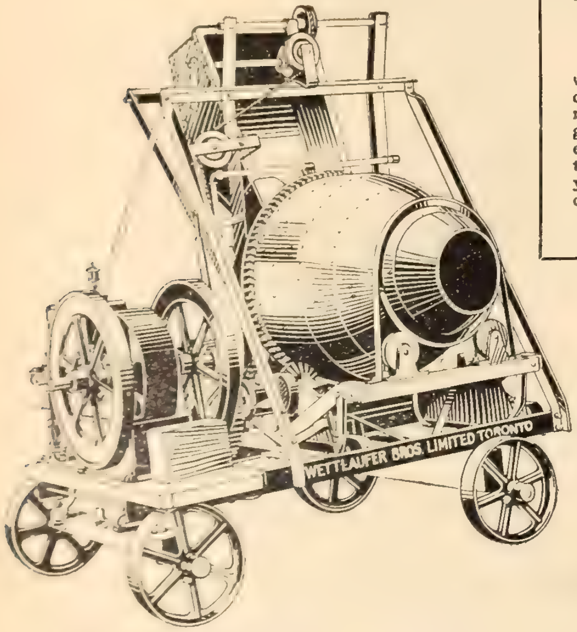
RING OILING SYSTEM

which keeps the machine thoroughly lubricated at all times, gives longer life greater freedom from trouble and enables you to run the machine with less power.



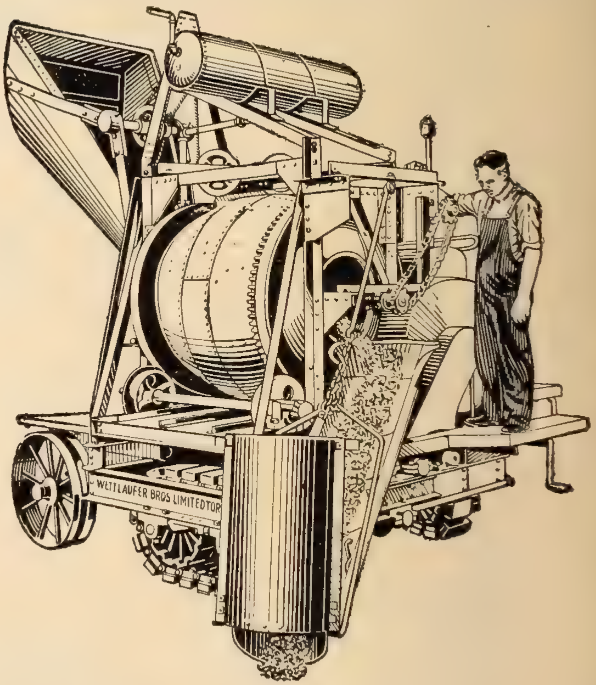
NOW REDUCED IN PRICE

Big demand from all over the world has made possible sweeping reduction in the price of our 6 cub. ft. stationary Drum mixer. You can now buy a Wettlaufer 1-B Mixer equipped with stationary batch bin or automatic loading hopper, with or without hoist, at a sensationally low price. Write for folder No. 205.



JUST THE MACHINE FOR BIG JOBS

Here is a 10 cub. ft. Wettlaufer Tilting Drum Mixer that will make money for you on bridge work, paving jobs, heavy foundation work and any construction where you require large production at low cost. Empties itself clean. Write for folder No. 206, showing complete line of Wettlaufer Tilting Drum Mixers.



FOR ROAD JOBS

Here is the latest Wettlaufer success—a stationary Drum mixer equipped with caterpillar traction. One man standing in one position has complete control of this great mixer. This machine will pay for itself on road work in a few weeks.

WETTLAUFER BROS. LIMITED, 183 Spadina Ave., TORONTO

Sold by all branches of the Canadian Fairbanks-Morse Co., Limited

HOISTS
CRUSHERS
BLOCK
MACHINES

WETTLAUFER
CONCRETE MACHINERY
AND CONTRACTORS' EQUIPMENT

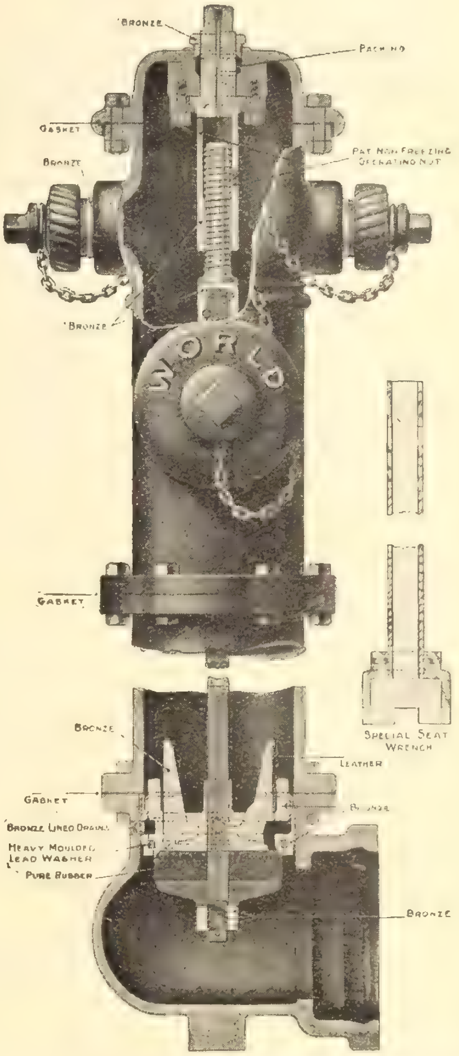
Write for
List of
SECOND
HAND
EQUIPMENT

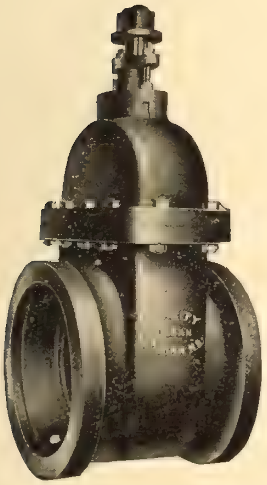
"McAvity" Fire Hydrants
and Gate Valves

"McAvity's" Hydrants and Valves have been the choice of engineers and municipal officials for nearly one hundred years. Today they are in service in every province in Canada and their numbers increase steadily.

Only products of exceptional merit could boast such a record.

"McAvity's" are "right"—in design, in materials, in workmanship. Make them your choice and you'll never have cause to regret it.





Catalogs, prices and full details are yours for the asking.

The World's
Standard
Since 1834

TRADE WORLD MARK
McAVITY'S GUARANTEE
"Demand The Brand"

J. McAvity & Sons. Ltd.

Valves Fittings & Supplies

Goods Guaranteed Good BY Almost a Century's Experience ESTD. 1834

St. John, N.B. Canada.

Covering the Continent with Stockland Service

There's a Stockland "Service Station" within 12 hours of your road job.

51 successful and responsible concerns cover the continent with Stockland Service—each has a Stockland-trained man and each maintains a full factory-type repair department.

Yet, in the face of old machines being a year older and in face of a greatly increased number of new Stocklands in service—this year the repair cost ***per grader*** on all Stockland machines (already the lowest of any grader) was ***cut exactly in half.***

This means that Stockland owners ***saved*** the amount of this decrease in repair costs—they also avoided the greater cost of the inconvenience and delay of ***needing*** repairs.

Send for Stockland 1923 literature—know why Stocklands make "better roads—cheaper."

AVOID AN UPKEEP COST NOT COMMONLY CONSIDERED.

When your grader needs repairs the largest cost is in the inconvenience and delay caused.

Stockland Quicklift Graders are ***built at the factory***—there's no re-building needed on the job.

Every part is designed for its special work and made of material best fitted to do that work.

You pay slightly more when buying a Stockland—but you save it all ***and more*** by the end of the first year's service.

Stockland literature will give you the details of this more satisfactory method of construction; also the Stockland over-strength frame, Built-in Steering Device, Cutting Blade, Curved Moldboard, and the Stockland Quicklift.

These are practical money - and time - saving features that appeal to long headed and far-sighted contractors and highway officials. It will pay ***you*** to know about them.

Stockland

STOCKLAND ROAD MACHINERY CO.
MAKING BETTER ROADS CHEAPER

ROAD MACHINERY CO ~ MINNEAPOLIS

2701 34th AVE. SOUTH

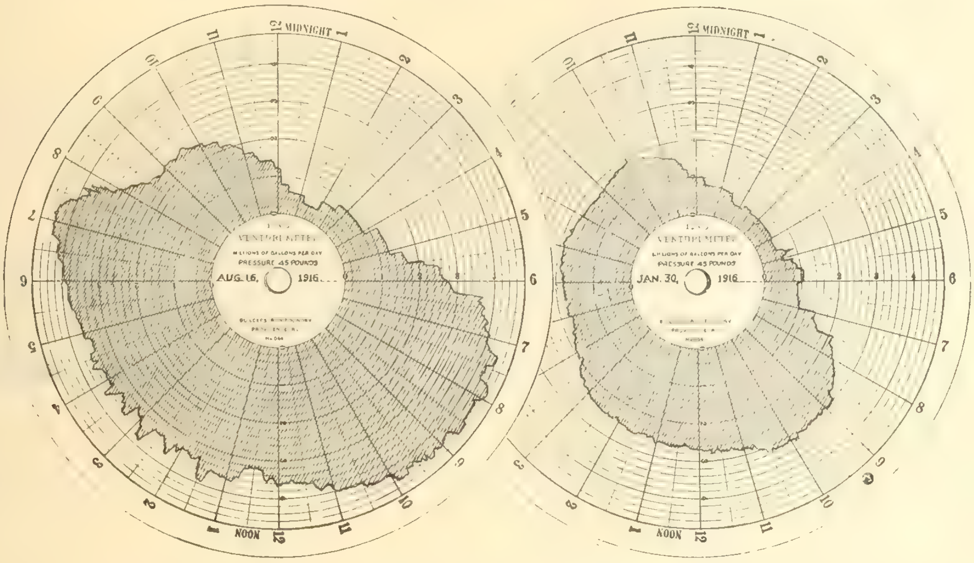
Canadian Representatives:

Richardson Road Machinery
Saskatoon, Sask.

Francis Hankin & Co., Limited
598-604 Union Ave., Montreal, Que.

BUILDERS VENTURI IRON FOUNDRY

A Water Waste Survey —and Then What?



Two Venturi Meter Charts Showing Reduction of Water Waste

It has been the custom to carefully test out a water works system on occasions and thereby find and correct leaks and improper use of water. The water waste survey is expensive but fully justified if the waste of water is reduced permanently. How is the Water Works Superintendent to know whether or not the efficient conditions are maintained?

The VENTURI Meter

"VENTURI"—Registered

will furnish him every day the information he needs to keep an accurate and positive check on the water distribution system. Every variation of flow is indelibly inked on the 12-inch chart from the Venturi Register—a record which is permanent and accurate. Any unusual flow is shown by the Venturi Meters and immediate investigation may be made to determine the cause. With Venturi Meters to help, a perpetual water waste survey is possible.

Venturi Bulletins sent on request

Builders Iron Foundry
Providence, Rhode Island

Canadian Representatives:
GENERAL SUPPLY COMPANY OF CANADA, LIMITED
Ottawa Montreal Winnipeg Vancouver
ALLEN GENERAL SUPPLIES LIMITED
Toronto, Ont.

The Largest Manufacturers of Concrete Pipe in Canada

DOMINION DOMINION

CONCRETE PIPE

As you want it **WHEN you want it**

REINFORCED

All sizes over 10″ reinforced with hard steel.

Stock carried in sizes up to 48″ diameter. Larger sizes made to order.

Write for Catalogue and Prices

Practically Indestructible

DOMINION CONCRETE COMPANY, LIMITED

Incorporated 1904

KEMPTVILLE — ONTARIO

Two 15,000 gal. Rivetted Tanks and one Three compartment truck tank supplied by us to The Pure Oil Co., Brantford

TANKS

For over thirty years we have been specializing in the fabricating of tanks (either welded or rivetted) and steel plate work of all kinds.

The accompanying illustration shows two of the many different styles of tanks we are manufacturing.

Our method of welding steel storage tanks is an absolute guarantee against leaking or breaking.

We build

Tanks (welded or rivetted), Steel Pipe, Elevators, Conveyors of all kinds, Steel Stacks, Steel Buckets, Dumping Skips, Screens, etc.

THE WATEROUS ENGINE WORKS CO. LTD., BRANTFORD, CAN.

ESTABLISHED 1886

Contract Record and Engineering Review

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reaching Architects, Engineers, Contractors
Municipal Officials, etc.
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Contracting Phases of Transportation

Such essentially business organizations as street railway companies are not generally regarded as construction concerns—at least the public does not look upon them as akin to or competitors of bona fide contractors. A little track replacement or right-of-way paving are undertakings that are perhaps considered legitimate and not too far removed from the ordinary and regular business of providing transportation for all and sundry, but as for erecting an office building or handling a few thousand yards of concrete are concerned, that is beyond the scope of a tramway organization. It is generally forgotten that the business of providing transportation does not begin with just running cars along well established routes, and collecting fares for providing this service. Before the cars can be run, rails have to be provided, electricity supplied, car sheds established and even office and administration buildings erected, to take care of the manifold operations that hinge on one another and result in the end in the safe carriage of human beings, a distance of perhaps only a few blocks. In

THE LAST PLASTERER

(Reprinted from The Wall Street Journal)

There is reason to apprehend that bricklayers will become as uncommon as veterans of the War of 1812. When one reflects on the princely wages of bricklayers, it is a lamentable thought that they have to die, but, as with all the world's great, no way has been found to save them this unhappy fate. An occasional veteran of the War of 1812 is recruited by fraud, and an occasional apprentice is admitted to membership in the Bricklayers' Union, but in neither case does the number of recruits begin to equal the mortality list.

The National Association of Manufacturers says that the number of apprentices admitted to the Bricklayers' Union last year was less than the number of members taken by death. At this rate, bricklaying will soon become a lost art, and our grandchildren will marvel at our skill in laying brick as we wonder at the lost processes of our remote ancestors who understood and practiced the tempering of copper.

The passing of the plasterers gives even greater reason for apprehension and disquietude, because they are passing even faster than the bricklayer. We replenish our streams with trout and we protect our song birds from extermination, but we take no thought of our plasterers. By reason of the limitation of apprentices, most of our plasterers are aged men and will not be with us for long. The years are not many when we shall regard with awe the last survivor of the Plasterers' Union very much as we regarded the last survivor of the charge of Balaklava.

With the growing scientific interest in these matters, it is not unlikely that the professors at our institutions of learning will soon undertake a study of this disappearing type as they do the small remnant of some of the aboriginal tribes. While there is yet time, we suggest that there be preserved on the phonograph for future generations the voice of a plasterer discussing long hours and slave wages, for the era is not remote when all we shall know of this species must come from a study of the fossil remains.

What antiquarian interest will there be in a fragment of freshly-spread plaster. We can see the last plasterer, a centenarian on his death-bed, painfully but skillfully spreading this fragment, at the rate permitted under union rules, for preservation in the Metropolitan Museum of Art, alongside the fragment of King Tut's flagon.

large cities, of course, the work that the transportation service has to do, besides the mere transit business, becomes more involved, and so it is that in a community like Toronto, we see the spectacle of a street railway organization becoming a vast construction concern.

Since September 1921, when the Toronto Transportation Commission formally took over the street railway services from the private company that previously operated them, there has been a tremendous amount of engineering and construction work carried on by the Commission's own working force besides large projects that, while handled by private contractors, were under the jurisdiction of the Commission's construction department. Indeed, having employed at times several thousand workmen, the T. T. C. became the largest construction organization in Canada. They built up a department under skilled heads that was remarkably efficient in directing intensive construction operations—in which category most of their work could be classed.

Several articles in the Contract Record have drawn attention to specific features of the T. T. C's construction program, largely track rehabilitation, in conducting which some unique methods were employed. The fact that unusual ideas were put into operation, and that the work of reservicing a worn out tramway service of a large city was conducted with a most remarkable speed, stamps the Toronto Transportation Commission at once as a most efficient construction organization. The work that they are doing today, while not so great in volume as in 1921 and 1922, is still conducted with that same efficiency and skill that always characterize the well organized and carefully managed contracting firm.

Burrinjuck Dam Nearing Completion

Situated in a narrow gorge in the heart of the southwestern mountains of New South Wales, between two mountains of red granite which rise 2,000 feet above the river bed, the Burrinjuck dam, which has been under construction for the last seven years, is now nearing completion. The great concrete wall, which is practically complete and only requires the finishing touches, is 752 feet long, 242 feet high, 160 feet thick at the base, tapering to 18 feet at the top, and is stated to be one of the largest dams in the world. It will impound the waters in a lake of 12,740 acres. The reservoir will have a capacity of nearly 33,612,000,000 cubic feet. The catchment area includes elevations of 5,000 feet which are snow-covered in winter and contains about 5,000 square miles drained by three rivers, which will be backed up to a distance of 41 miles. The depth of water at the dam, when filled to full supply level, will be 200 feet, and two miles above the dam the submerged flats will be covered by 150 feet of water over an area of five square miles.

The irrigation scheme provides for water supply to farm areas at Yanco, Leeton and Griffith, extending for 250 miles along the bed of the Murrumbidgee river. Many of these farms have already been occupied and cultivated, and at full capacity the scheme will provide irrigation water for about 400,000 acres. The soil and climate in this area is suitable for the production of apricots, peaches, nectarines, prunes, pears, plums, apples, almonds, citrus, fruits, wine and table grapes, raisins, sultanas, figs, olives, and most varieties of vegetable and fodder crops. A considerable portion of the area was reserved for repatriation purposes.

The Week's Developments in a Nutshell

Outwardly, conditions have not improved during the week, but fundamentally, Canadian industries are in a very strong position. Just to mention a few favorable factors—(1) Crop prospects have never been better; (2) Hydro-electric developments under way are much the largest in our history; (3) Our North Country is proving richer every day in minerals; (4) The pulp and paper industey, in which it can be said that Canada leads the world, represents a guaranteed increasing demand; (5) Our people are frugal as shown by the fact that the savings of the people are steadily increasing.

There is no reason why we should go to the extremes practised in the United States. There has been no boom in Canada comparable with that in the States and there is little evidence of the panicky feeling our neighbors are showing at present. There is some seasonal let-up in building and in demand for building materials, but we must remember that an increasingly large number of people are so fully occupied, one way and another, with holidays during July and August, that they do not give thought to building and buying—either for house life or business. The best evidence, perhaps, that this is considered only a temporary condition is the maintenance of prices. If manufacturers and supply men feared a steadily reduced demand they would doubtless stimulate buying by concessions in prices, but there is no evidence of this.

From the United States, the report comes that common labor is more plentiful. Steel production shows a slackening tendency. In Canada the tendency is slightly in the same direction, though the strike in the Maritime provinces tends to increase the demands made upon the other plants. In the construction industry it becomes more evident daily that the greatest need is for apprentices. The increase in skilled mechanics is not equal to the death rate. It is a problem that calls for co-operative, immediate action. Not only the contracting industry itself, but the great mass of the people are at the mercy of a few skilled laborers whose grip is tightening every day.

Prices remain stationary. Paint alone shows any sign of movement, with downward tendency, but so slight as to be almost negligible.

Compressed Air in Construction Work

Recent Developments in the Use of Pneumatic Machinery

The Third of a Series of Articles Indicating How Compressed Air Can be of Great Service to the Contractor—An Indispensable Agent that Saves Time and Money

By F. A. McLEAN

Portable hoists—like the "Little Tugger," for example—have been very successful in handling pipe. They skid and haul lengths into place and lower them into the trench. After the joints are calked, hoists of this kind will also scrape the backfill into place.

In tunnel work these portable hoists haul muck cars, skid timbers, hoist steel work into place, and in doing all sorts of similar jobs save considerable time and money by reducing the man-power needed. They are made in several sizes and in both single and double drum types.

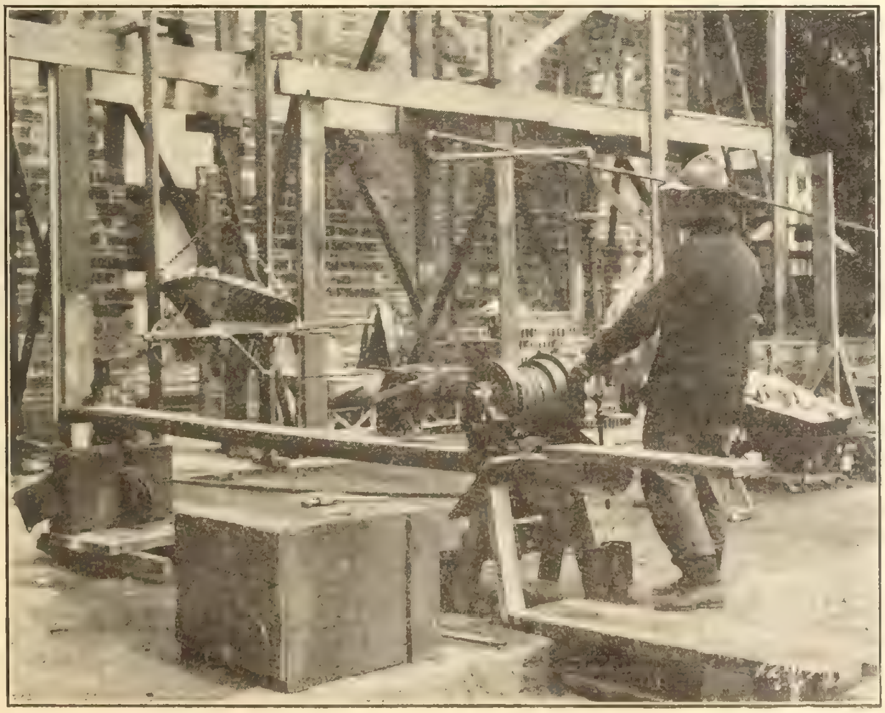
Portable Pneumatic Grinders

A light weight pneumatic grinder is a great convenience on jobs out in the field where the usual facilities are not at hand. Such a grinder will do a wide variety of work which would otherwise prove difficult or be indifferently carried out.

A pneumatic grinder may be used, wherever there is air available, for grinding and cleaning purposes or it may be strapped to a bench or held in a vise and used for sharpening various tool points. It has been found very useful for squaring up bits and shanks and grinding bits of rock drill steels, so important in maintaining efficient rock drilling.

Drilling holes for service pipes. With this rotary drill it is possible to drill through basement and soil to the curb, thus eliminating the need of tearing up sidewalks, etc.

A quite recently developed use for pneumatic tools is in connection with the installation of service pipes under sidewalks, curbs and pavement. Pneumatic hammers have been used to cut the required

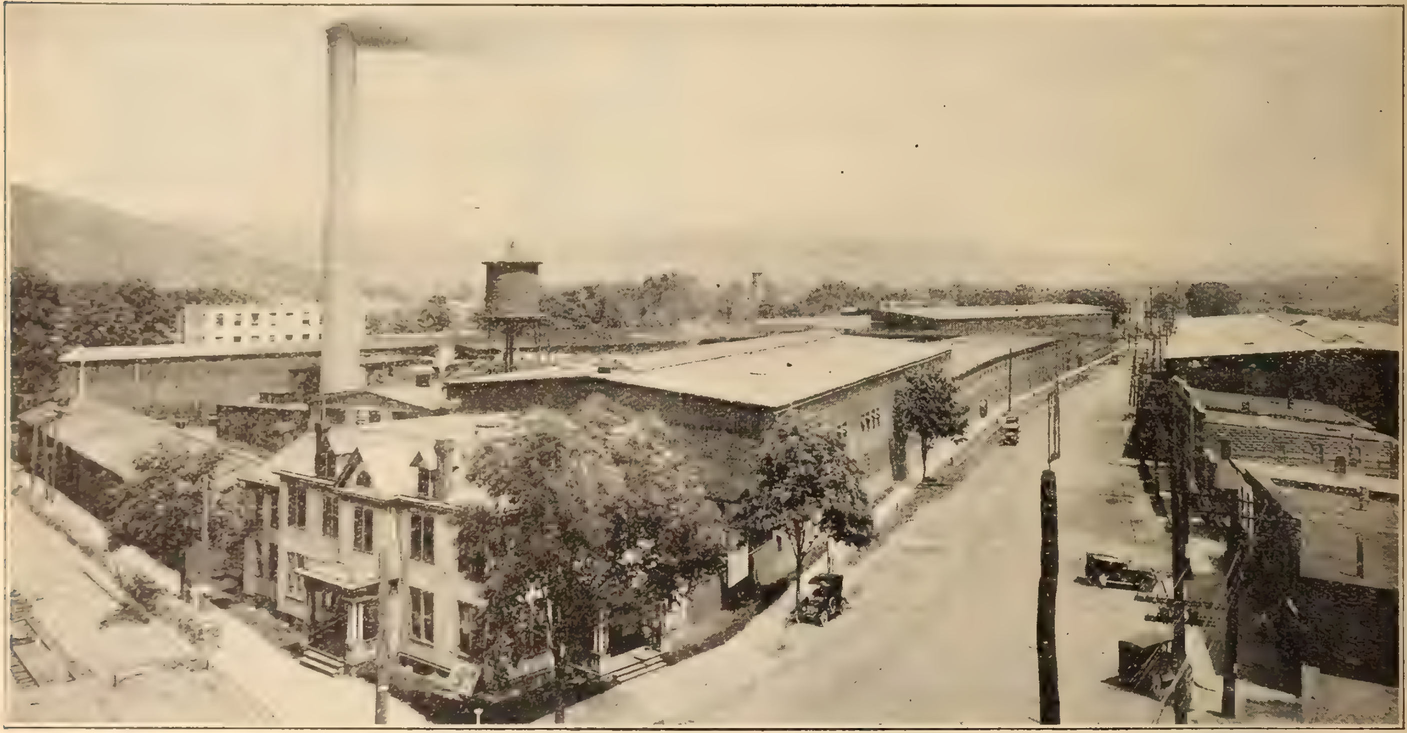


Portable air or steam operated hoist raising bricks. These units are obtainable in various sizes and with one or two drums. They are well suited for operating drag scrapers.

holes through basement walls; pneumatic drills have then been employed to drill holes through the earth through which the pipe connections could be driven by still other air operated hammers, thus doing away with the necessity of breaking sidewalks and excavating as would be the case with hand methods.

The average saving per service installed has been found to be over $12.00 compared with the former hand method. This represents the labor saved on the pipe installation and the labor, material, trucking, etc., saved on sidewalk repairs. With hundreds of service connections being made every month by various public service companies, the employment of pneumatic tools offers a very satisfactory reduction in the expense.

The way the tools are used is shown in the accompanying illustrations. A small chipping hammer is first used to cut the holes in the basement wall. An air drill fitted with an auger then drills a hole underneath the sidewalk and curb. If a boulder or a rock obstruction be encountered it is sometimes necessary to use a drill of the Jackhamer type to break through, although this procedure would depend upon the general character of the soil in the particular territory.



The exterior of these metal-sheathed factory buildings was cleaned and painted by two men, using compressed air, in approximately 100 working days

A powerful air hammer such as the paving breaker is often used to drive the pipe through the drilled hole underneath the sidewalk and curb.

Machine Versus Hand Method of Installing Services

A recent comparison of the two methods of installing services made by a large Eastern public service company gave interesting data on this work. The figures cover the installation of over 50 service connections requiring over 1400 feet of pipe. Over 1000 feet were driven by pneumatic tools and the balance by hand methods, the latter work involving the opening of flags and excavating.

Hand Method

No. of feet of pipe installed	444
Total Cost of installing (exclusive of cost of pipe)	$408.40
Average cost per foot of pipe installed, including cost of opening flagstones, etc.	000.92

By Pneumatic Tools

No. of feet of pipe installed	1006
Total cost of installing (exclusive of cost of pipe)	$234.50
Average cost per foot of pipe installed	000.23

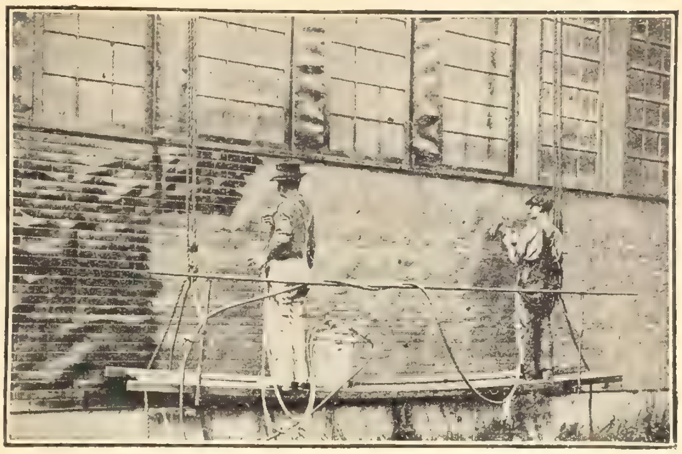
Cleaning and Painting by Compressed Air

Spray painting by compressed air has, within the last few years, almost entirely replaced the costly and inefficient hand brush method. Particularly is this so in factories, machine and car shops, bridge and locomotive works, and in automobile plants; and building contractors now rely almost entirely on this system in the case of big structural undertakings.

In general, spray painting can be divided into two distinct classes. Of these, stationary painting, which is partly illustrated and described here, is probably the one not so well known and, therefore, least used, and yet it offers a much broader field for general application than does industrial finishing. The industrial finishing method usually calls for a spraying room, completely equipped, from the compressed air line down to the fume exhausters. The parts to be painted are moved into this room; placed on a swivel-top turntable when size and shape permit; painted, and then taken from the room to dry. This system of painting is most commonly as well as extensively used in the furniture and the automobile industries where the parts are small or of medium size, more or less symmetrical in shape, and easily handled. This method is also used for spraying enamel paint on kitchen ware, table tops, brick, terra-cotta, etc.

However, stationary painting, that is, painting

A close-up of the air-driven wire brush in action. With a brush of this sort a man can clean, in a given time, an area four times as large as he could if he used a hand brush



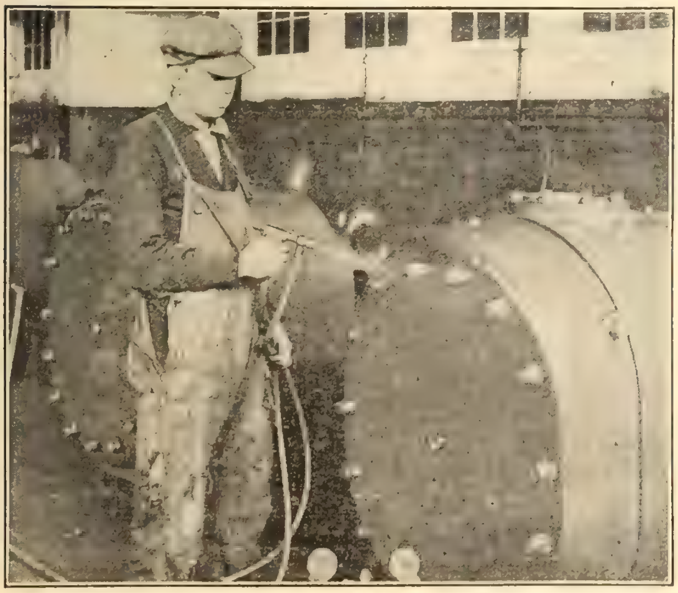
In cleaning and painting a metal-sheathed exterior, these men were able to do their work rapidly and well by means of a pneumatic drill equipped with a wire brush and a paint-spraying outfit

railroad cars, the exterior and the interior of buildings, ships, structural steel, locomotives, and the parts of stationary engines which sometimes weigh many tons, represents quite another problem. In this case it is obvious that the painting outfit must be brought to the job and not the job to the painter.

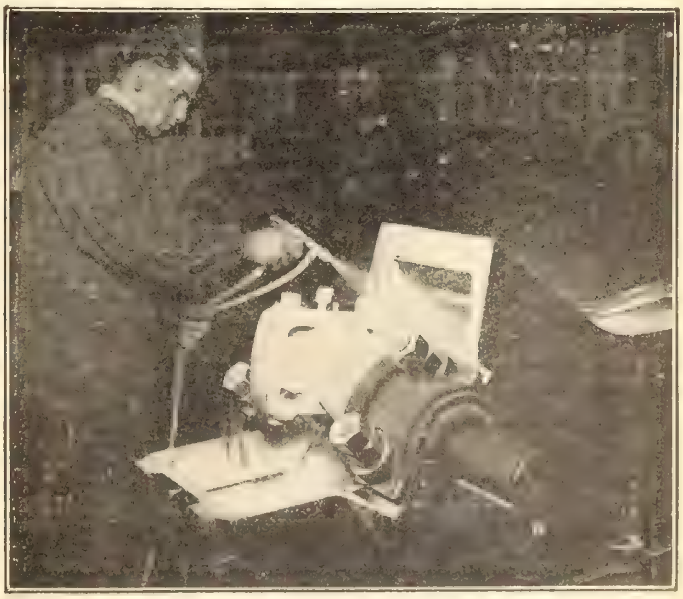
The exterior of the metal-sheathed factory, shown in one of the illustrations, was cleaned and painted by two men and by the use of compressed air in approximately 100 working days. By the aid of a 60-foot hose extension, connected with the compressed air lines already installed, it was possible to lead air to practically all parts of the work; and air at approximately 90 pounds pressure was thus obtainable for operating the cleaning brush and the paint spray. While the work was in progress, it was found that several small, outlying buildings and some fences were too remote from the pressure lines to permit the use of the regular extension hose. In order to save time and expense, a small, portable compressor was sent to the job, after which cleaning and painting by air were continued uninterruptedly and without resorting to the slower hand-brush procedure.

The system used by these two men in cleaning and painting the outside walls of the building in question is unique in that both operations were performed from the same scaffolding, and at the same time; the painters covering practically the same surface without delaying or interfering with each other. Working on a 12-foot scaffold, swung from sharply pointed hooks by means of a two-strand block and tackle, a downward sweep twelve feet wide was finished at each placement. At every new location the painter would confine his work to the window sashes until the man with the air brush had cleaned enough of the surface to warrant the painter shifting to that area. Thus the cleaning was always far enough in advance of the painting to obviate keeping the painter waiting. The cleaner, who, of course, completed his work first, then finished "running" that is, painting the window sashes before moving the scaffold.

Including sheds, fences, and main buildings, 150,000 square feet of surface was painted; and, in addition, it is estimated that 60,000 window sashes were run. The entire job consumed 350 gallons of paint; one gallon covering on an average of 430 square feet of surface. This does not take into account the hand running of the window sashes which in itself is quite



The paint spray used to speed up the application of the finishing coat to machinery



In the shop. Giving the interior surfaces of a machine a finishing coat with the paint spray system. It was found that the paint spray worked equally well with air pressure varying from 40 to 100 pounds per square inch, thus giving ample evidence of a wide range of adaptability. From four to seven cubic feet of free air per minute were required for operating the paint spray, depending upon the air pressure.

A "Little David" No. 6 drill, used in cleaning the surface preparatory to painting, was equipped with a wire brush, about six inches in diameter, made especially for cleaning metal surfaces. The average life of the brush was found to be only three days, after which, being beyond repair and inexpensive, it was thrown away and replaced by a new one. The air drill operating the wire brush was found to be far more efficient than a wire hand-brush because it cleaned off not only the dirt but also took off with it the old paint, rust and grease. The fresh paint was then put on clean metal and not over old paint or grease, which in the past has proved very unsatisfactory. The air drill employed is rated by the manufacturer as requiring nineteen cubic feet of free air per minute at 90 pounds pressure. The man operating the cleaner found that the brush cleaned fully as well at 60 pounds pressure as it did when working at pressures up to 100 pounds.

Above—Savings of more than 50% have been reported by railways and industrial concerns using portable paint spraying and sand blasting equipment on steel structures

Right—The value of pneumatic painting equipment for painting mill interiors is well known

Merits of the Air-Driven Cleaning Brush

To sum up, the advantages of the air-driven cleaning brush are so many and so obvious that only a few need be mentioned. A man with an air brush, as shown in the illustration, cleans four times as much in the same period as one operating a wire hand-brush. Furthermore, the cleaning is thorough and not a case of merely brushing off the dirt. Hand brushing is a back-breaking job which involves much standing around, and, therefore, lost time, the success or failure of it depending entirely upon the vigor with which the brush is applied. The operation of the air-driven cleaning brush is simple enough; it is necessary only to turn the air on or off by a squeeze of the trigger.

The man using the air paint spray was able to cover fully twice as large an area per day as he could have done had he used the hand-brush method. Besides, the paint spray was more economical in the use of paint; averaging 430 square feet per gallon, and it put the coat on slightly heavier and much more evenly than is practicable with the hand brush. This is due to the fact that there is no loss of paint by drops or "slop" of the brush, and to the better covering qualities of paint applied by air spray. The spray automatically does away with any laps, brush marks, or skimped places, so common to hand-brush painting. It is believed that if there had been no window sashes to run, the job could have been finished in one-fifth the time required to paint the buildings by hand brush; in other words, it is estimated that for straight surface painting the air paint spray is about five times as rapid as the hand-brush method.

The interior views that are shown, illustrate the painting of completed parts in a large shed where the assembled products are given a finishing coat of paint prior to crating and shipment. Inasmuch as the parts or the complete machines sent to this paint shop sometimes weigh several tons, a system of stationary painting is employed. That is, the machines to be painted are placed on the floor of the paint shop, painted, and there allowed to remain until dry, after which they are moved to the shipping department. the painting of these machines consists of a series of preparatory coats of anti-rust fluid and filler, which is applied to all parts of the units except the machined surfaces. A coat of shellac is then put on by air paint spray, and on top of this is sprayed a coat of finishing paint. One of the most important advantages of spray painting over the hand-brush method is the ease with which the thickness of the coat can be regulated.

Spraying nozzles of a dozen different types and sizes are obtainable which may be adjusted by simply turning a nut with the fingers so that either a wide fan-like spray or a narrow, concentrated spray can be had—the latter for use on small pieces. The different sized nozzles available can be used with fluids ranging from the thinnest shellac to the thickest filler or enamel. Where the nature of the fluid warrants it, an air-operated agitator is used to keep the solid matter in suspension as, for instance, in applying bronze or similar mixtures. Furthermore, fluid containers can be had in any size from the small 1-ounce cup to the 10-gallon separate container equipped with an air agitator.

As has been said, air-spray painting covers the surface smoothly and evenly and without streaks, fatty edges, or the brush marks so common in hand-brush painting. Thin edges and corners, as well as elaborately carved pieces of work, can be dealt with in a remarkably short time and without calling for special skill on the part of the operator.

Quality Standards for Cement

The Voluntary Setting-up of Rigid Specifications has Made Cement a Product of Unquestioned Reliability

By F. W. KELLEY*

President Portland Cement Association

Quality and quantity standards are essential for the free interchange of commodities in commerce beyond the stage of first hand transactions in which personal observation and opinion govern. Progress in civilization is measured by commerce so standards are at the base of civilization as well as of commerce.

There are at least twenty industries in which nation-wide quality standardization has been undertaken to a greater or less degree. The one with which I am most familiar is the portland cement industry in which a quality standard for cement was voluntarily established through the co-operation of a large number of public and private engineering and technical organizations concerned with the use of cement.

Each industry has its special conditions and special problems but I believe the same principles apply to quality standardization in all industries, and that properly worked out, favorable results in them all will follow. The experience of the portland cement industry may therefore be useful to other industries.

Portland cement was discovered and patented in England ninety-nine years ago. Its manufacture was carried on principally in England, France, and Germany until 1872 when its production was begun in a small way on this continent. The manufacture of cement is an exact chemical-mechanical process in which natural raw materials are ground and mixed; combined at a white heat to form a new artificial material called clinker, which is again ground to a finished product. The process is exactly controlled technically; uses large quantities of fuel and power; has large plant investment and slow capital turnover. Manufacturers must rely upon a large volume of business to make profits on this heavy commodity which is of limited shipping radius, and which sells at a pound price lower than any other highly manufactured article.

Portland cement when completely manufactured and ready for the consumer, is in its relation of usefullness to the community, a means and not an end. Its useful end is that of an essential ingredient in making concrete. Cement, unlike many commodities, is not consumed. A concrete structure properly made has a permanent asset value. Full realization of this asset value, continued demand for cement, and the prosperity of the industry, depend upon right quality cement and right quality concrete.

Anybody anywhere may attempt to make concrete and the results reflect for all time the materials and methods used in the first few hours of its history. It is essential to all interests that the user of cement make good concrete.

Factors in Cement Industry

The work of the Portland Cement Association, organized in 1902, which is a recognition of this mutuality of interest between cement user and manufacturer, is so closely bound up in the development of the industry that it must be here mentioned. The Portland Cement Association is an international organization of cement manufacturers whose aim is to increase the knowledge, utility, and use of portland cement through scientific investigation, public education and national promotion. It "sells" the lse of cement, but not the commodity. Hence it is not concerned with prices nor other trading relations between its members and their customers.

It performs only such functions as cannot as well if at all be performed by its members individually. It undertakes only such activities as are for the common good and whose benefits when utilized, flow alike to all contributing members.

The association is much concerned with the quality of cement marketed by its members, since a poor quality cement furnished by any member would reflect upon the industry, decrease the use of cement, and hence injure every member. It has been especially concerned not only with right quality cement, but with learning how to use cement right, and with making this information universally known. It maintains a research laboratory and field forces for these special purposes.

Mention should also be made of the American Society for Testing Materials, organized in 1902 "for the promotion of knowledge of the materials of engineering and the tne standardization of specifications and the methods of testing." Its members are both producers and consumers familiar with the matters covered. Specifications are formulated and adopted under carefully prepared rules of procedure insuring to the highest degree, sound unbiased results.

Important factors in the situation are the Bureau of Standards with its group of trained experts and extensive laboratory equipment, and the several engineering societies.

Development of Specifications

With this background of conditions and factors affecting the industry we can now more intelligently trace the development of quality standards for cement.

In the early years when the industry on this continent was small, its quality standards were imported.

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*Based on a paper read before the Fabricated Production Group, U.S. Chamber of Commerce.

As the industry developed, the American Society of Civil Engineers undertook to formulate a uniform method of tests for cement, and from 1885 to 1903 this was considered the most reliable guide to a proper method of procedure.

In this period, many engineers and architects seemed to feel, perhaps to avoid reflection upon their professional skill and progressiveness, that it was necessary to add to an old cement specification, some new requirement on each new job. A compilation of ninety-one cement specifications made in 1898 by Mr. R. W. Lesley, who later became first president of the Portland Cement Association, showed that scarcely two were alike. In many cases, the specification requirements were contradictory, and if strictly followed, would sometimes impair the quality of the cement. The result was unnecessary cost and endless annoyance, confusion, delay and difficulty for the consumer and manufacturer alike. A standard specification was becoming a necessity.

The American Society for Testing Materials, took the lead in supplementing the investigations of the American Society of Civil Engineers, and in 1904 the first American Society for Testing Materials specification for cement was adopted. Other interested organizations continued to study and to modify cement specifications and methods of tests sometimes within their respective organizations, and sometimes through joint committees.

The method of the American Society for Testing Materials was unique in that its committee on cement specifications represented consumers as well as producers. This brought to bear upon the specification requirements a knowledge not only of the needs but also of the possibilities.

Adoption of Specifications

The final revision of the cement specification was unique, also, because its requirements were subjected to the most careful laboratory research and checked with experience in the field. The substitution of the facts of research, for unsupported opinion, had its logical effect in reconciling views of men with engineering training. A single standard cement specification became an accomplished fact and was recognized by all established organizations.

As the standard cement specifications were developed, much work was required to secure their general use. Engineers who for twenty years had been active in the engineering societies which formulated and later adopted the specifications, readily accepted them. Others not as familiar with the progress made, continued to use their own specifications until the mass of data and authority back of the standard specification was brought to their attention, when they generally were glad to join in establishing a single standard, the advantage of which they at once recognized.

Neither did all producers at once take up the specifications as developed. In the early days of the industry, blended and adulterated cements were sold under many brands.

Producers in some cases were reluctant to give up making cement to conform to certain special specifications because of a supposed advantage in marketing thus obtained by them. The research work and tests made in establishing the standard specifications showed, however, that the existing variations from the standard were without economic value to the consumer. The general adoption of the standard specification by the engineer and consumer decreased the demand for cement made to special specifications, but it should be accounted a credit to these producers that they were willing to cut out the "bunk" so frequently used in selling, and provided a product having known and tried qualities and value.

Features of Specifications

At the present time, the standard specification for cement is almost universally used. Thus we now have a nation-wide quality standard for portland cement voluntarily accepted by both consumers and producers. It is the highest standard for cement and has had an important effect in promoting, extending, and improving the use of concrete.

When compared with the earlier specifications it is particularly noticeable that the fineness of cement is now measured with a sieve having 40,000 openings per square inch, a weave so fine it will hold water; instead of with relatively coarse sieves which have now been discarded. The strength requirements are nearly double those of early specifications and are determined by improved methods.

The standard cement specifications establish in most essential particulars minimum requirements, thus encouraging improvement. A quality standard must be responsive to changes demanded by new conditions in use or in production.

The cement committee of the American Society for Testing Materials is charged with the duty of studying proposed improvements in the cement specifications. Each suggestion is carefully tested and weighed, for in a material of such fundamental importance there must be certainty that changes are improvements. Laboratory practice has now reached a point where it is possible to determine this with a high degree of accuracy and laboratory results can always be supplemented by field tests.

Advantages of Single Standard

The working out of this situation and establishment of a single standard quality specification for cement has had, and must continue to have, many advantages for consumers, producers, and the community as a whole.

The engineer and designer can rely upon getting anywhere the standard quality cement contemplated by the plans. Concrete can be designed of definite strength and quality. Simple rules have been made by which even the inexperienced can with care get good concrete. Greater efficiency in production and lower cost has been made possible through continuous operation on a standard product. A standard product can always be kept in stock ready for use. A standard product is more readily accepted in export trade. Wider production of cement has been made possible by eliminating unnecessary limitations on raw materials.

Conclusions

Industries which have not already established standards may well consider carefully the advantages of determining standard specification requirements through voluntary action by consumers and producers, rather than wait for a specification determined by some outside authority to be imposed upon them.

The principle underlying this standardization is that underlying all progress—the movement from the indefinite to the definite. The trend is certain. To voluntarily accelerate progress in the direction it will inevitably take, is the part of wisdom.

Economies in English Sewage Plant

New Activated Sludge Scheme, Being Installed in Reading, Eng., is Expected to Give a Record in Economical Operation—Provision for Variation in Flow

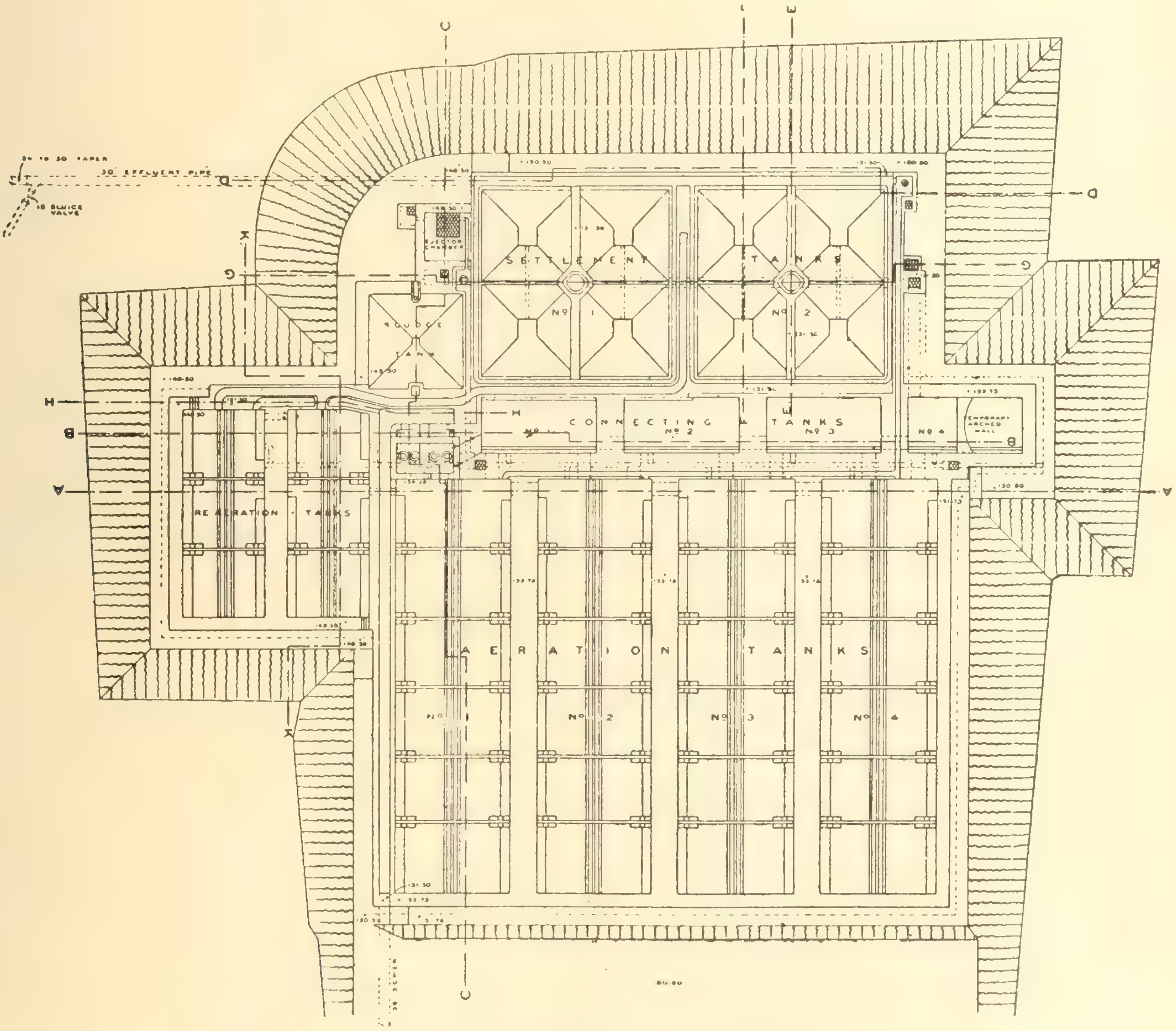
Readers of the Contract Record who are concerned with the sewage disposal problems will be interested in a description of an activated sludge plant of considerable capacity that is being built in Reading, England. An outline of its main features is here presented through the courtesy of "The Surveyor." This new scheme is of particular interest, as it was the first achieved sludge process scheme to be sanctioned by the Ministry of Health to treat the whole flow of sewage from a large town with all its varying strength and rates of flow. The greater part of the borough is, however, drained on the absolute separate system, and, in consequence, in times of storm the maximum volume of liquid delivered to the farm is small compared with other towns where the combined or partially seperate system is adopted. The existing method of sewage disposal at Reading is by broad irrigation. The area of the sewage farm is about 850 acres, of which about 450 acres are laid out for irrigation.

It is expected that the total cost of the activated sludge tanks and equipment, including the air compressors, to treat 3½ million gallons per day will not exceed £60,000, or, say, £17,000 per million gallons treated. The present population is about 90,000, thus the cost is about 13s. 4d. per head, and on the basis of the future estimated population of 120,000 allowed for it is 10s. per head.

Electricity from the local supply is to be used, but the amounts above stated do not include the cost of the power house and the electric equipment.

The surplus sludge from the process is to be disposed of on a specially prepared area of the farm land owned by the corporation.

From the drawing it will be seen that the sewage enters the process tanks by a 36-in. pipe after being



Plan of Reading activated sludge works

screened and freed from detritus. The sewage first enters an air-lift sump, where it meets the return activated sludge, and the mixed liquid is lifted from the sump by air-lift pumps into the first aeration tank.

Aeration Tanks

The sewage and sludge flow through the four aeration and four connecting tanks in sequence, in which tanks they are kept intimately in contact by the circulation created by air which is injected through the porous stones arranged in cast-iron containers at the bottom of the tanks.

Settlement Tanks

The aerated sewage from the last connecting tank flows to the two main settlement tanks. Each of these has four pyramidal pockets, and over each pocket is a "Clifford" inlet. The mixed sewage and sludge fall gently to the bottom of the pocket, leaving the sludge behind, and the liquid rises free of sludge and flows away, over periphery weirs, by the 30-in. effluent pipe to the outfall. The flow through these settlements is alternated, the full flow passing for a period first through one and then through the other, thus giving a quiescent period in which the sludge becomes concentrated. This method ensures the complete clearance of sludge from each settlement tank periodically. The sludge from the settlement tanks rises from the apex of the pyramids by hydrostatic head into the sludge channel by which it flows to the two re-aeration tanks, through which it passes in series, and finally flows into the air-lift sump to meet and mix with the inflowing crude sewage.

Surplus Sludge

To avoid any considerable increase of sludge in the system over that required for the purpose of the process, the surplus is drawn off from the sludge channel to the sludge settlement tank, the draw off being either continuous or periodic as found convenient.

Sludge Concentration Tank

The sludge settlement or concentration tank is similar to the main settlement tanks, but with a single pocket and fitted with a "Clifford" inlet. The sludge, as drawn off from main settlements, has a moisture content of about 99.5 per cent. When the tank is full the supernatent water flows away continuously until the tank is full of concentrated sludge. A period of quiescence is then allowed for further concentration, and the remaining supernatent water is drawn off by a decanting valve. The concentrated sludge can be drawn off and the sludge tanks completely emptied to the ejector sumps and lifted by the ejectors to the sludge disposal area.

Operation

Every aeration, connecting, re-aeration and settlement tank unit can be completely emptied, the top water by an air-lift pump and the bottom water and sludge by means of ejectors. (2) Every aeration or connecting tank unit can be filled with final effluent by an independent air-lift pump; the effluent pumped into unit forces out before it the previous contents into system, leaving unit full of effluent, when aeration can be stopped. By this means the number of aeration units in operation can be reduced, the sludge from such units being concentrated in the tanks in operation. The tank units out of commission standing full of aerated effluent can be brought instantly into operation as and when an increased flow or increased strength of sewage calls for a longer period of stay. (3) During several hours at night in dry weather the flow is small and weak, and this flow can be accommodated in the empty stand-by unit; thus during this period in dry weather the aeration machinery can be completely stopped. (4) The air injected into the tanks for purpose of aeration can be by either continuous or pulsating flow as found most economical.

Testing Highway Materials

Ottawa, July 7th, 1923.

Editor, Contract Record:

Some time ago, the Contract Record and Engineering Review published a splendid editorial concerning the recent installation by the Laboratory for Testing Materials of the Department of Public Works, Ottawa, of equipment for testing bituminous materials entering into street and highway construction.

I regard it as advisable to give some further notice of the fact that this equipment is available for use by those interested; and would appreciate your publishing the statement herewith enclosed. In so doing, I am sure you will promote a better type of construction not alone in work being carried out by the provinces in connection with the Canada Highways Act, but also in certain cities and towns which have been induced to purchase what they have believed to be bituminous and other materials of value, but which tests have shown to be inferior and when used, have been responsible for much waste of public money and dissatisfaction with bituminous materials in general.

The federal government is by no means entering into the field of commercial testing work, but it is felt that some encouragement should be offered to all highway authorities, to have tests made upon highway construction materials by some competent testing laboratory. Rather it is intended by every means possible to promote the conducting of tests by commercial laboratories, wherever possible, and to encourage tests on work under the direction of engineers who have neglected this phase of construction hitherto.

Yours very truly,
A. W. Campbell,
Chief Highway Commissioner.

The statement which Mr. Campbell enclosed is as follows:

The construction of bituminous macadam and bituminous concrete roads in Canada is now becoming quite general upon semi-rural and rural routes; and such work is involving large outlays by the provinces and municipalities concerned. A number of such projects have been placed under agreement by the Dominion government, calling for federal aid. In order to ensure satisfactory work, as far as the bitumen, cement, etc., being used are concerned, the Canada Highways Commission has made arrangements with the Laboratory for Testing Materials, Department of Public Works, to the end that all materials entering the construction of highways in the different provinces, with federal aid, may be tested according to the latest methods.

It is the expectation of the federal authorities that increased attention be given in future by all highway engineers to the conducting of established tests upon the various materials being used in the high class types of construction now being demanded by the travelling public.

Hints for the Contractor

How Large Shovel was Lowered Into Deep Pit

A large stone company near Chicago has just installed an Osgood No. 73, 3-1/2 cu. yd. traction shovel for use in the quarry. The pit is about 80 feet deep and is reached by a very steep incline. To get the new machine into the pit would ordinarily be quite a problem, but when equipped with traction wheels the problem was much simplified. With boom up and dipper and handle in place the shovel was backed down the steep declivity under its own power without difficulty.

Shortly after this shovel had been placed in operation a train of loaded dump cars was derailed when some distance from the shovel and on the way to the incline hoist. The traction shovel was thrown into gear, run down to the cars, a chain hooked over the dipper teeth and around the cars. In a few minutes the train was rerailed and on its way to the hoist while the shovel went back to the rock face ready for work. It would have been necessary to unload the cars to rerail them by hand, and then reload them. While this was being done the shovel and other cars would have been standing idle if the ready mobility of the shovel had not saved the day. The shovel has also been used about the quarry for handling boilers and other heavy machinery that would require the services of a locomotive crane.

A steam shovel lowering itself into 80 ft. pit on steep incline

How to Handle and Install Steel Sash

When your shipment arrives, don't give the carrying agent a clear receipt without first having checked your bill of lading and seeing that sash are in good condition, and all complete. Claims for shortages and damages should be made against the carrying agent immediately.

A reasonable amount of care should be used in unloading the windows. It is not advisable to throw them around, drop them on the corners or to pile them carelessly on rough ground or uneven surfaces. The advantages gained by proper design, the use of high-class materials and careful workmanship on light ornamental frames of this kind may be entirely destroyed by careless and unintelligent handling during unloading and installing.

When the windows arrive at the building site, they should be stacked on edge. Be sure that the stringers are in a level plane and that the windows are not warped or twisted. The windows must not be laid horizontally or piled one upon the other.

All windows containing ventilators have the ventilators tightly wired to the main frame. These wires must not be cut or removed until the windows are erected in the opening and rigidly fastened in place ready to receive the glass.

To insure absolutely satisfactory results the following rules must be rigidly followed

(1) Be sure all sash are in perfect condition. If in handling or shipping some of the bars become bent by accident they can be readily straightened and hammered into line again.

(2) Erect the windows plumb and in a true vertical plane. Be sure that the horizontal muntins of adjacent units line up exactly. If the wall openings are out of square, do not attempt to distort the windows to meet this condition. Correct the fault in the wall opening. Do not use steel crow bars or wooden prys in erecting steel sash.

(3) Be sure that the blocking up wedges are placed directly under the outside jamb sections and at the mullions.

(4) Leave ample clearance at head, jambs and sill so that the ventilators will open freely.

(5) The sash are not designed to carry the weight of any of the building construction. It is necessary to provide the requisite structural material to support such loads. Be sure that ample clearance is allowed at the head so that a deflection in the structural steel lintel or a settlement in the brick pilasters will not cause the steel sash to carry the load of the building construction and become badly bowed.

(6) After the windows are carefully erected in the openings—square, plumb and rigidly fastened in place—the wires at the ventilators should be cut. Make sure that the ventilators operate freely and fit tightly against the the weathering of the frame when closed. If for any reason, the vents when closed do not touch evenly at all contacts, spring them into position by closing gently on a wooden wedge placed at the point where vents hit weathering first. A small lever may be used to correct alignment of muntins when vents have been forced out of square.

See that all vents swing clear before glazier putties glass and do not permit the fastening of grappling hooks for attaching scaffolds or any weight other than that of the glass to be placed on sash frame or vent.

After the ventilators have been carefully inspected, the hardware should be attached. See shipping list. All vents are provided with holes and brackets to properly receive either push bar or spring latch and chain hardware. The hardware is carefully boxed and listed and shipped in suitable packages. An ample supply of all required fittings is always sent.

How is Asphalt Used in Road Construction?

Paper Read at the Convention of the Canadian Good Roads Association Describes the Various Asphaltic Types of Pavements and the Practical Considerations Governing Their Selection

By I. W. PATTERSON
Chief Engineer, Rhode Island State Board of Public Roads

A comprehensive treatment in reasonable space of the subject of asphalt surfaces is made rather difficult because of the wide diversity of uses of asphalt in highway construction. A discussion of asphalt surfaces of course cannot be confined to a single type of pavement. Perhaps there is no material employed in highway construction which has a wider range of adaptability than has asphalt. Asphaltic products are equally serviceable for surface treatment of cheap surfaces and for the construction of such high types of pavement as bituminous concrete and sheet asphalt.

It is probably an axiom that any professional man in treating a subject having to do with his profession unconsciously colors his remarks to conform to opinions and theories which he gains in his individual practice. Perhaps therefore it would be advisable for the speaker to describe briefly the problem of State highway construction in Rhode Island. Although Rhode Island is the smallest State in the United States, it is the most densly populated. The dense population of course is reflected in highway travel. There are 50 per cent more motor vehicles per mile of rural road owned in Rhode Island than any other State in the United States, and it is reasonable to suppose therefore that the travel upon the State highways of Rhode Island averages heavier than the traffic upon any other State system of highways in the United States.

The initial adoption of bituminous surfaces upon the State highway system of Rhode Island was in 1906, and the use of bituminous surfaces in State highway construction and maintenance has continued since that time without interruption.

Foundations and Drainage

In view of the fact that asphalt surfaces are plastic rather than rigid, proper foundations and proper drainage of highways laid with asphalt surfaces are features of prime importance. Perhaps therefore the speaker may be pardoned for devoting some space to this very important feature incident to the construction and maintenance of asphalt surfaces.

It appears to be logical to consider separately two classes of asphalt surfaces in connection with a discussion of foundations and drainage. We have first the non-monolithic construction and we have, second, monolithic construction.

In the construction of non-monolithic types it is very apparent that the strength of the pavement is no greater than the strength of the base upon which the pavement rests. Prejudice against non-monolithic types of asphalt pavements in a great many instances may be attributed to failure due to foundation defects rather than to failure due to inherent weakness in the surface. The speaker suggests that success in treating the sub-grades of non-monolithic asphalt pavements to the end of that stability will be secured at all seasons of the year is a factor contributing to success of non-monolithic types of asphalt pavements under traffic which in many places is considered to call for monolithic construction only. In the northern portion of our continent the design of foundations for all types of pavement surfaces must be studied with a view toward protecting the surfaces against destruction by frost action. It is a matter of common knowledge of course that the season of the year which is accompanied by the greatest damage to our highways is the season during which the frost comes out of the ground, Manifestly therefore it is not sufficient for us to design our roads for conditions which exist in the summer only. It is necessary for us to anticipate the worst conditions, and those conditions prevail at the time of the year referred to.

In constructing non-monolithic asphalt pavements we will do well to study carefully the subject of capillarity in the subsoil. The fact that the surfaces may be waterproof is of little avail in keeping water out of subsoils of high capillarity, because the phenomenon of capillarity results in drawing the water from the side ditches and shoulders under the pavement. The fact that the pavement is waterproof appears to be more effective in preventing evaporation of water introduced to the subgrade by capillarity than it does in preventing saturation of the subgrade.

The interruption of capillarity in the subgrade is an elementary problem. Since the degree of capillarity is in inverse ratio to the sizes of interstices in the soil, it is apparent that the introduction of a layer of material of law capillarity directly below the pavement will eliminate many of the ills which non-monolithic pavements are subject to when over soil of high capillarity. In practice it has been proven that the theory is correct.

Materials which may be introduced below the pavement to interrupt capillarity may be coarse, sandy gravel or field and wall stone. A wide range of materials are known generically as gravels. In specifying gravel for an insulating layer to interrupt capillarity it is considered to be advisable to insure effectiveness of the material by indicating a maximum limit in the percentage of fine particles. It is our practice to specify that of the material passing a 2-mesh screen not over 25 per cent shall pass a 40-mesh screen. A material furnished to comply with this specification we have found to be very effective in eliminating the disastrous effects upon non-monolithic pavements resulting directly from the action of frost upon fine-grained soils of high capillarity.

In some cases we believe that stone is very much more effective than is bank run gravel. Upon many of our rocky hillsides, where the problem of foundations and drainage is complicated by the existence of pockets of soil of high capillarity together with decided flow of water in the fissures of ledges, we favor the use of a stone fill, so-called. The stone fill apparently is capable of taking care of a considerable amount of seepage which cannot be interrupted before it gets into the substructure of the road. Where the subsoil is particularly unstable, we favor a layer of gravel meeting our gravel specifications under the stone fill in order to prevent the unstable soil from working up into the interstices of the stone foundations.

The depths to which gravel and stone foundations should be laid to insure the pavement against damage by frost action should vary to meet varying conditions of the subsoil. Unfortunately we know of no definite rule to follow in the solution of these problems, and in consequence our practice is reduced to certain empirical rules which have been found by experience to be safe.

The problem of diagnosing subsoil conditions accurately is particularly difficult. Serious trouble may be experienced in sections where ledges are numerous, not by faults inherent to the subsoil, but by bars of ledge which interrupt the natural seepage with the grades and which thereby cause "frost boils" in the spring. It is our practice to carry out an intensive study of our subsoil conditions during the winter and also during the early spring when the frost is coming out of the ground. Observation of conditions existing in the periods during which these studies are made is very valuable for use in the design and foundations. Manifestly there is much more to be gained by examination when conditions are at their worst than there is by examination when conditions are at their best.

It is believed that the study of foundations and drainage of pavements laid upon typical city streets which are curbed and which have paved sidewalks is a vastly different problem from the design of similar types of pavements in rural sections where the shoulders immediately adjacent to the road necessarily are subject to saturation.

Selections of Types of Asphalt Pavements

In selecting for a given project an asphalt pavement to meet the requirements of the purse it is decidedly impracticable to determine upon one of the higher types of asphalt pavement unless there is sufficient money available for the project to permit of following the best standard practice in design, selection of materials and construction methods. It appears to be true without question that inferior service rendered by asphalt surfaces in some cases may be attributed directly to deliberate cheapening necessitated in order to conform to the requirements of the purse. In the construction of asphalt pavements, as in the construction of all other types of pavements, the fundamental features governing the design of the pavement to insure durability are of the utmost importance. It is a temptation to many engineers to select for projects very high types of asphalt pavements rather than the cheaper types. The expenditure for the higher types of pavements necessarily is high, even though there be an attempt to reduce the initial cost at the expense of service rendered by the pavement. The failure of a pavement as expensive as the higher types of asphalt pavements, due to neglect to build substantial value into the pavement, is an economic waste. Unless the higher types of pavements can be built as they should be, it is believed that substantial surfaces of lesser cost are preferable.

Since asphalt surfaces vary from the inexpensive surface treatment of gravel roads or of macadam roads to the expensive and durable bituminous concrete and sheet asphalt surfaces, the selection of asphalt types frequently permit of taking full advantage of existing roads. An old macadam road which is extremely rough but which is not subject to serious foundation defects provides an admirable base for an asphalt surface subjected to moderate traffic. In attempting to make existing roads serve as bases for asphalt surfaces a very careful study of the existing roads is essential. Whether the treatment be confined to protection of the surface of the existing road only by means of spraying bitumen over its surface or whether one of the many types of asphalt pavement be selected, it is not policy to permit weak spots to remain without attention in the existing road. Manifestly of course the more expensive the type of asphalt surface selected, the more important it is from the standpoint of economy to insure stability in the existing road which is to serve as a base.

There are few communities today in which the public demand for good roads may adequately be met, because of the impossibility of providing sufficient funds. Upon many very heavily travelled thoroughfares it may be impracticable to attempt to capitalize fully in connection with betterments the values of the existing plain macadam or gravel roads. Upon routes of secondary importance, however, many times improvement is impossible unless advantage is taken of substantial existing roads. A substantial macadam road especially, regardless of how rough it may mave become under traffic, supplies for moderate traffic an excellent base for several types of asphalt surfaces. Taking full advantage of the old road so that the original investment is not completely thrown away is commendable in many cases where the travel is not too heavy.

If an attempt be made to realize an appreciable value from existing roads, we must study the matter of selection of types fully as intensively as though the improvement contemplates complete reconstruction with no attempt to take advantage of the existing road surface. Ordinarily it is not policy, for instance, simply to scarify the old macadam surface and to harrow it and then to apply bitumen to the old road metal with an attempt to secure an asphalt macadam surface. Rather than to experience the poor results ordinarily following that method, probably it would be better practice simply to scarify the existing surface and to apply a surface treatment.

Taking full advantage of old macadam roads in the construction of new surfaces is not a simple task. In a great many cases, however, it is perfectly possible and is very commendable upon economic grounds.

In selecting an asphalt surface for a given project it is essential of course to study the matter of availability of materials suitable for the various types of asphalt surfaces. The farther the site of the project is removed from railways or from waterway transportation facilities, the more important it is to study the adaptability of the local materials. For a project far removed from railroads and not possible of being served by water transportation, surely it would be short-sighted to select an asphaltic macadam pavement, provided the only stone available is not suitable for that type of construction and provided there is available locally a supply of material excellent for use in bituminous concrete construction. The reverse is equally true. An exhaustive study of road building materials always is absolutely necessary if economy is to result.

Correlating the character of the improvement to the traffic to which the road will be subjected of course is a necessity. No one seriously expects to secure sheet asphalt service by surface treated gravel. In the same way it is illogical and impracticable to supply a sheet asphalt pavement for a surface treated gravel demand. If we are to consider our investments for public highways in the same light that we consider investments of private capital in other industries, we must adopt some logical method of computing comparative values of different types of pavements under various types and volumes of traffic.

Adaptability of Asphalt Surfaces to the Progressive Improvement of Roads

During the past few years we have heard a great deal concerning the progressive development of highways. This plan has been selected in many sections as a logical solution of the highway problem. This plan is recognized as an expedient method of supplying public demand for extensive mileage of improved roads. Those who favor this plan hold forth the argument that a study of the economics of highway improvement is incomplete without including a careful analysis of the value rendered the travelling public by reducing transportation costs. It is true without question that our development of highways is purely a transportation problem, and it is necessary therefore to consider the economics of highway development not only from the standpoint of highway expenditure. A study of the problem in its broad aspect must include a study of the service rendered.

In sparsely populated communities especially a study of future traffic needs may disclose the necessity for a system of highways including a fairly large percentage of the higher types of pavements. Rather than immediately to start constructing pavements of that sort it is considered by many to be better policy to adopt the progressive method of highway improvement to the end that more people may be served in reasonable time than would be the case otherwise. If the community cannot bear the financial burden of securing the ideal result within a reasonable time, there appears to be a good argument for progressive development.

The wide diversity of types of asphalt surfaces make it possible to carry out a comprehensive plan of progressive development of roads by the use of asphalt, progressing from the cheaper types to the more expensive types. In adopting this plan manifestly it is desirable so to carry out the program that there is a minimum waste in years to come when betterments in surfaces are brought about. Assuming that the initial improvement under a plan of progressive development consist of a gravel road, it is obvious that economy commends the securing of grades and alignments suitable for a more durable surface to be laid in the future. It is equally essential to have the initial gravel road properly drained and substantially constructed, so that there is no appreciable weakness.

For moderate traffic treatment of bitumen over a gravel surface will serve the purpose very well for a number of years, provided proper maintenance is carried out. Perhaps the next step in progressive development would be the laying of a light macadam pavement over the gravel road to serve ultimately as a base for some higher types of pavement. For maintaining the macadam surface also bitumen applied for surface treatment will permit serving traffic very well. It is apparent of course that in laying the macadam surface care must be taken to have the cross-section conform approximately to the cross-section of the higher type of pavement to be selected at some future time.

The third step in development might be either an asphalt macadam surface or a bituminous concrete surface laid over the old macadam as a base. It may be on the other hand that one of the higher types of asphalt pavement is considered to be desirable as the second step, in the latter event a substantial gravel road serves admirably as a sub-grade for a pavement, and its presence very likely will permit reduction in the depth of pavement which would be required otherwise.

Bituminous Surface Treatment

The use of bitumens for surface treatment of gravel and macadam surfaces was one of the first steps undertaken to enable roads of that type to withstand motor vehicle traffic. Surface treatment of these surfaces with bitumen at present is widespread. Although for heavy travel treated roads are not considered to be practicable, the method still is looked upon with favor for roads carrying moderate travel, especially by way of preservation of old roads. Provided there is no serious foundation trouble so that the surface is not destroyed annually by frost action, a properly built gravel road or a properly built macadam road, when surface treated, will stand up under a considerable volume of travel.

Surface treatment of gravel and surface treatment of macadam are somewhat different problems. In surface treating a gravel road it appears to be essential to employ a bitumen which has some penetrating power and which therefore does not lay upon the top in the form of a mat. Excellent results in surface treatment of gravel roads are secured from the use of cut-back asphalts which are very fluid and which seem to acquire a more intimate bond with the gravel surface than do more viscous materials. In some localities the plan of using a priming coat of light material of very low viscosity followed after an interval of a few weeks by a treatment with a heavier material is favored.

The surface of a well built macadam road swept free from dust ordinarily may be treated with excellent results with the more asphaltic oils. It appears to be the sentiment now in most localities that the heavy asphaltic oils are more desirable for surface treatment of macadam surfaces than are the light dust laying oils used so commonly a few years ago. It is questionable, however, if the use of the more expensive heavier products is desirable if the road surfaces are destroyed annually by frost action. Successive treatments of a well built macadam road not subject to foundation weakness develop with proper maintenance a surface capable of standing up under heavy traffic. The accumulative benefits of successive surface treatments cannot result if a road is weak so that the surface completely breaks up annually as a result of frost action.

Corrugation of surface treated roads is considered by many to be a serious defect characteristic of this type of surface. Ordinarily excessive corrugation is due to the selection of improper materials or to the accumulation of too great an amount of bitumen upon the surface. More frequent light applications of bitumen are considered to be more effective than less frequent heavy applications. Many times also it is considered good judgment to touch up spots where the surface treatment is defective rather than to apply to the entire surface a coat of bitumen which may result in an excess upon the surface and consequent corrugation.

Asphalt Macadam

The technic of the construction of asphaltic macadam appears to have received less attention than has the technic of the construction of the higher types of asphalt surfaces. Perhaps this may explain the prejudice upon the part of many highway engineers against this type of pavement. It is a fact that in many sections asphalt macadam has proved to be a very inferior type of surface, hardly preferable to several cheaper surfaces. On the other hand there are in the United States many instances of very economical service having been rendered by asphaltic macadam pavements under heavy travel. In Rhode Island we have asphalt macadam pavements rendering economical service upon roads carrying a maximum daily traffic of approximately 10,000 vehicles per day and a daily average for the entire year of approximately 4,000 vehicles per day. Some of these surfaces are ten years old, and are in excellent condition.

Some of the faults characteristic of asphalt macadam pavements in many sections are corrugation of the surface and local raveling of the surface due to improper bond. Perhaps the most common fault, however, is foundation defects which should not be considered necessarily as detracting from the merit of the pavement.

Excessive or progressive corrugation of the surface can be eliminated by careful selection of materials and by proper attention to numerous construction details. Raveling of the surface also may be overcome.

The result of improper selection of materials for asphalt macadam pavements perhaps is more spectacular than is the case with some other asphalt surfaces, and the result is more quickly perceptible. We favor for the construction of asphalt macadam the selection of hard and tough stone. For very light traffic of course stone which is softer and less tough may be practicable. Since our practice of asphalt macadam construction contemplates that the stone in the penetration course will be subjected directly to the abrasion and impact of traffic, our reason for selecting hard, tough stone is apparent. We do not believe that an appreciable excess of bitumen upon the surface is desirable, so that it appears to us that a stone must be used which successfully will withstand the effect of abrasion and impact of travel directly upon it.

Three Sizes of Stone Recommended

We believe also in the use of three sizes of crushed stone in constructing an asphalt macadam surface, each size to be screened between close limits. The stone into which the asphalt is introduced, which we know as the penetration course, is specified to be of sizes passing a 2½ inch screen and retained upon a 1½ inch screen. After the first penetration of asphalt a smaller size of stone is selected to fill the surface interstices. We believe that this keystone, as it is called, should be of sizes which readily will permit the separate particles to enter the surface interstices of the penetration course. We believe that the sizes should be such that the surface voids in the penetration course will not be so completely closed that the second application of bitumen, or the sealcoat as it is called, will not penetrate. Ordinarily we specify the keystone to be of sizes passing a 1 inch screen and retained upon a 5/8 screen.

After the application of the sealcoat we favor a cover stone of sizes smaller than the keystone so that the smaller surface voids remaining after the sealcoat is applied may be filled by the cover stone.

Ordinarily we specify that the cover stone shall be of sizes passing a 5/8 inch screen and retained upon a 3/8 inch screen.

The sizes of stone indicated above as the sizes called for in our specifications contemplate primarily the use of basalt and diabase.

For asphalt macadam construction we favor the use of bitumens of penetration between 90 and 100. In some cases where our roads are canopied by trees we employ a material somewhat softer. If stability of surface is to be secured, we believe that the use of materials softer than 120 penetration should be eliminated.

In the construction of our asphalt macadam pavements also we insist that the penetration course of stone shall be uniformly 2½ inches in depth. Below the penetration course we employ a base of crushed stone which is sand-filled, and which is of uniform depth from 2½ inches to 5½ inches, depending upon character of foundations, upon character of subsoil and upon traffic. We do not believe in attempting to penetrate a single course of stone of depth greater than 2½ inches after compression because we feel that proper compression is impossible and because we feel also that the asphalt finding its way below the 2½ inch level is of no practical value.

We favor the use of a liberal amount of asphalt. Our specifications provide for the use of 1 3/4 gallons of asphalt per square yard of surface for the penetration course and from 3/4 gallons to 1 gallon per square yard for the sealcoat.

Rolling of Asphalt Macadam is Considered Good Practice

We feel that the importance of rolling asphalt macadam roads frequently is overlooked. Our base course of crushed stone always is rolled until there is no perceptible motion under the roller. The sand filler is applied in small quantities during the rolling operation so that it does not blanket upon the surface. We favor also heavy rolling of the penetration course of stone previous to the application of bitumen. Unless a soft stone is used which breaks up badly under the roller, we preceive absolutely no merit in the theory frequently advanced that heavy rooling of the penetration course of crushed stone previous to the application of the asphalt is injurious. We attempt to secure the maximum mechanical bond possible previous to the application of bitumen, so the asphalt serves primarily to intensify and preserve the mechanical bond.

Spreading the keystone is given attention in our practice. The riding surface is no smoother than the surface at the end of the process of spreading the keystone. Bunching of the keystone results inevitably in an uneven wearing surface. The use of insufficient keystone to fill the voids results in an improper mechanical bond and an open mosaic surface which is subjective to raveling. A wide brush attached to a frame fastened to the steam roller is found to be very effective in securing even distribution of the keystone at a nominal expense only.

After the application of the keystone the pavement is well rolled before the sealcoat is applied. Subsequent to the application of the sealcoat the pavement is rolled at intervals for at least one week. The final or back rolling we believe to be very essential in this type of construction.

We favor distribution of asphalt by one of many highly developed motor distributors. We do not favor gravity distribution. Distribution under high pressure we believe to be essential in securing uniformity in distribution and effectiveness in distribution.

Asphaltic Concrete and Sheet Asphalt

In the majority of types of asphaltic concrete it appears to be particularly essential to secure the maximum density which is practicable. It is particularly important to investigate carefully the grading of the fine particles in the mixture. It is generally considered desirable to secure a grading of sizes of particles passing a 10-mesh screen which conforms substantially to a standard sheet asphalt grading. Manifestly of course the proportion of material passing a 10-mesh screen must be correlated to the coarser particles in order to secure stability.

Recently intensive study has been made of the reason for corrugation in bituminous concrete surfaces and in sheet asphalt surfaces. It has been found that excessive corrugation of these surfaces in the majority of cases is due to the improper grading of the mineral aggregate, especially lack of filler, and to the use of asphalt of improper consistency. The use of excessive amounts of asphalt also is considered to be one of the causes of excessive corrugation. In preparing mixtures of these types it appears to be absolutely essential to correlate the asphalt binder to the mineral aggregate according to methods which are well defined.

Until very recently it has been considered generally that pavements of this type should be laid upon monolithic foundations. Recently there has been a tendency in many quarters to favor the use of resilient foundations. Excellent results frequently are secured from the use of macadam bases under surfaces of both types.

The use of black bases, so-called, is a recent development. Arguments in favor of the use of such bases usually are that a resilient base of that character reduces the effect of impact to the surface and that a more intimate bond may be secured between the surface and the base. Those who are in favor of bases of this type as opposed to monolithic bases argue that a monolithic base under the impact of travel in effect serves as an anvil to the detriment of the surface. The use of black bases is so recent that a large number of definite results based upon long years of use are not available.

Sheet asphalt perhaps is better standardized than is any other asphalt pavement. The speaker has no suggestions to offer in regard to the construction of sheet asphalt surfaces except to suggest following the best standard practice.

Maintenance of Asphalt Surfaces

Ultimate success in the use of asphalt pavements depends as much upon successful maintenance as upon successful construction methods. There are many methods of maintaining each type of asphalt pavement and some of the methods perhaps are of questionable value. The function of maintenance is not only to preserve a smooth riding surface, but maintenance should be planned with the idea of securing from the pavement the maximum ultimate life which can be secured economically. Methods of maintenance which tend to destroy uniformity in the surface inevitably result in shortening the life of the pavement.

It seems logical to suppose therefore that repairs to pavement surfaces should be made with materials similar to the materials employed in construction and that the methods employed in using the materials should be substantially identical with the methods adopted in construction. Repairing of breaks or cuts in bituminous concrete surfaces and in sheet asphalt surfaces ordinarily is taken care of by replacement with mixtures such as were used in the original construction. In maintaining asphalt macadam surfaces, however, it is common practice in many sections to employ only the simple and expedient method known as cold patching. Cold patching also is employed in some localities extensively for maintaining some of the cheaper forms of bituminous concrete. The use of cold patches in asphalt pavements of the better type well may be considered as questionable practice except as a temporary expedient to take care of the situation until more permanent repairs may be made.

In our asphalt macadam road patching of holes seldom is required except where cuts are made for the purpose of installation or repair of underground public utilities structures. Our repair of bituminous macadam roads consists very largely of light touching up of spots in the surfaces which are porous as a result of unequal distribution of the bitumen. For this work we favor using an asphalt of approximately the penetration used in the construction of the road. We believe that this practice tends to promote uniformity in the surface and thereby favors the securing of the maximum economical life of the surface. We do not favor for this local surface repair the use of light cold materials.

Cold patching appears to be particularly adapted for use upon surface treated gravel roads and upon surface treated macadam roads. For the repairing of breaks in either of these surfaces it is almost out of the question to attempt to restore the surface in the manner in which it was built.

Resealing

A feature of maintenance aside from light repairs which is customary upon all types of asphalt surfaces, except upon sheet asphalt and similar surfaces, is resealing with asphalt at intervals of several years. It has been remarked previously that danger sometimes attends the practice of employing upon surface treated gravel roads, and upon macadam roads too frequent applications of bitumen to the surface. The same may be said of bituminous macadam and bituminous concrete surfaces. We have in our State bituminous macadam surfaces which are ten years old and which never have been resealed. The accumulation of excess bitumen upon the surface we believe is dangerous because it tends to promote corrugation of the surface and tends also to make the pavement excessively soft during warm weather. We take care of local abrasions to the surface and of spots where the surface is porous for some reason by local treatment only, but we can see little excuse for applying a sealcoat to the entire surface of the pavement simply because there are a few local defects.

What has been said concerning resealing of asphaltic macadam roads applies in general to resealing of asphaltic concrete roads. It appears to be true that many pavements of both types are injured almost beyond redemption by injudicious resealing. It is not always a case of too frequent or too liberal applications of bitumen to the surfaces, but it is sometimes a case of the use of improper materials. We do not favor the use of soft products for resealing the surfaces of either type. For resealing bituminous concrete surfaces we favor the use of a paving cement of from 60 to 70 penetration. For resealing of bituminous macadam surfaces we favor the use of an asphalt of penetration between 120 and 150. Ordinarily we employ machine distribution of materials employed in resealing asphaltic macadam surfaces. For resealing bituminous concrete surfaces we favor the squeegee method because it appears to be difficult to secure a uniform distribution sufficiently light by motor distribution.

The amounts of material used for resealing should depend upon the character of the surface which is treated. It is our intention not to form a mat upon the surface but to make the surface water-tight by filling the small voids in the surface which may develop under traffic.

It would seem that one of the common faults in maintaining asphalt surfaces of the higher types is that sufficient thought is not given to the question of prolonging the life of the pavement, but the immediate demand for a smooth surface is supplied in the most expedient way only. In general attention to the plan of designing maintenance methods to the end that maximum life of the pavement may be secured is considered to be desirable.

Maintenance of Concrete Pavement

By L. H. NEILSON*

The maintenance of concrete pavement involves the usual attention to shoulders, ditches, drainage structures, markers and signs and care of the roadside. These items are usually handled by gange as the work is periodic.

The Bates road tests show how small breaks rapidly enlarge under the impact of heavily loaded motor trucks. It is therefore extremely important that an organization be on the job to take care of joints, cracks and holes when they first appear.

Inasmuch as a considerable amount of material and equipment is needed, gangs of varying size are best adapted to care of filling joints and cracks. Soil or loose or old joint filler which has become brittle should be removed and the joints or cracks carefully swept out with stiff fibre or wire brooms. The joint filler should be poured into the joints or cracks by means of a conical pouring pot affording absolute control of the flow of the material. Such a pot having a capacity of about 2½ gallons will enable the workmen to use the minimum of material, and place it exactly where needed with the minimum amount of effort. Dry sharp sand should be swept out, filled with bituminous material and covered with clean, hard stone chips or pea gravel.

Uneven joints caused by frost heaves or expansion must be cut out for 8 to 12 inches at least and far enough to remove all shattered concrete, the ends made vertical and then refilled with the best quality of concrete and carefully finished and levelled off.

Where concrete pavement becomes shattered or broken down over an area of more than one square yard, it is advisable to remove it entirely and put in a concrete patch. All of the area containing many cracks should be taken out, excavating well below the old pavement. The edges of the holes should be as regular as possible. The edges should be as nearly vertical as possible, undercut if anything. If conditions will permit, bleeders or underdrains should be dug out and refilled with stone, small pieces of concrete or gravel. The mix used in the patches should be according to the best practice and the mixing, placing, finishing and curing should be as carefully done as on new construction. Hydrated lime or calcium chloride is usually used to hasten the setting. About 5% by weight will permit the patch to be opened to traffic in about a week.

In case any considerable amount of patching is necessary some mechanical paving breaker will be found economical and a central mixing plant should be considered. The mixed concrete may be delivered in trucks.

Resurfacing of Old Concrete Roads

Some old concrete roads have been resurfaced and widened with concrete and good results secured by using a 4" thickness over the old pavement. This method is nearly as expensive as a reconstruction job. If the old pavement is in reasonably good condition, widening two feet or more on each side and placing a bituminous top over the old pavement should be considered.

Old concrete in good condition can be widened by the addition of a new strip three to five feet in width on each side of the old concrete. The excavation should be slightly lower than the base of the old pavement. If the edge is rounded, it must be broken off. A central mixing plant delivering concrete by means of an industrial railway will be found economical. In this way the operation will offer the minimum obstacle to traffic. Only one side is done at a time for the same reason.

Due to the rapid increase in traffic many pavements are so narrow that considerable shoulder maintenance is necessary. Gravel, stone or in some cases penetration macadam is required to keep the shoulder solid and level with the edges.

Comparative Maintenance Costs

Costs taken from quarterly statement made by the counties show the following averages. These costs include all expenses incurred within the right of way, such as work on grade, snow removal, markers and signs, equipment rentals, direct supervision and overhead:

	1919	1920	1921	1922
Earth	128.19	292.62	268.57	175.27
Stamp sand	.....	396.18	415.66	357.44
Gravel	251.99	756.95	666.94	451.22
Macadam	190.20	645.61	806.09	431.23
Bituminous macadam	....	451.25	525.95	222.91
Bituminous concrete	....	.....	514.09	1,021.16
Cement concrete ...	658.85	1,795.23	829.81	414.76
Unclassified	228.43	454.90	512.34	303.24

Unclassified covers a mileage consisting of maintenance sections containing more than one type of surface so reported that the division of costs could not be definitely determined.

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*Deputy State Highway Commissioner, Michigan.

The Contract Record's

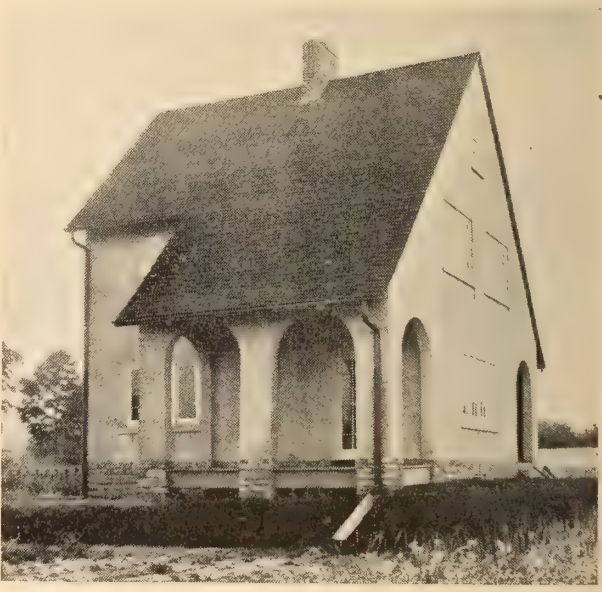
Weekly House Suggestion No. 76

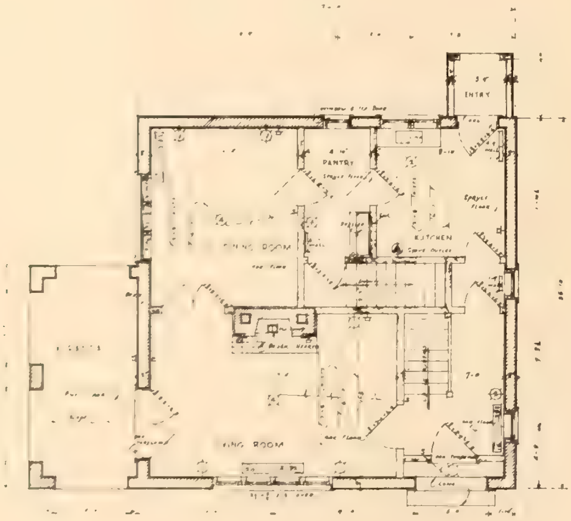
We are illustrating this week a very pretty type of stucco home which is just being completed on the corner of Eastbourne and Tranmer Ave., in the beautiful North Toronto residential district. The exterior construction is stucco on Natco hollow tile and the trim is Owen Sound limestone. The design of the front entrance porch is a very attractive feature of the general appearance. There is a roomy verandah on the left side of the house, with direct entrance, through French doors, on the living room.

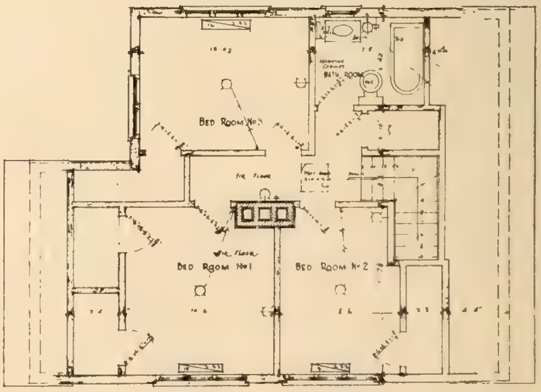
The layout of the first floor is unusual and interesting, two features in this connection being the location of the main staircase and the pantry. The trim downstairs is whitewood and the floors are of oak. The large bright living room is equipped with a handsome brick fireplace, as seen on reproduced plan.

The upper floor accommodates three roomy bedrooms, bathroom and several carefully placed linen and clothes closets. The trim upstairs is pine, white enamelled, and the floors are of edge grain fir. The basement is full size and contains boiler room and the usual coal and storage space.

The house was designed by the architectural firm of Mathers & Haldenby, Manning Chambers, Toronto, and built by Messrs. Graham & Sibbett, 9a Wellington E.







B. F. Sturtevant Co. Buys Western Plant

Owing to increasing business and the desire to be of still greater service to its customers, the B. F. Sturtevant Company have purchased the plant of the Wisconsin Engine Co., makers of Corliss Pumping Engines at Corliss, Wisconsin. This new acquisition covers nearly ten acres and the buildings have approximately 150,000 feet of floor space. A full manufacturing and engineering staff will be maintained and closer co-operation given to western customers.

Mainly Constructional

East and West—From Coast to Coast

An explosion recently at the plant of the Canada Gas & Electric Corporation, at Brandon. Man., resulted in a temporary interruption of the city's electrical supply and street car service.

"Prospects are very encouraging for continuous work in the building industry throughout the whole of the next winter," was a statement made recently by Mr. Douglas Bremner, president of the Montreal Builders' Exchange. This would be quite an abnormal situation in Montreal, but owing to the number of works that have already been booked, and the number waiting to be started, the possibility of continuous work throughout the whole of next winter is considered very bright.

The Sydenham Brick & Tile Co. Ltd., formerly known as the Wallaceburg Brick & Tile Company, at Chatham, Ont., which was closed down last winter for repairs, is now operating on full time again. E. C. Morse is manager of the plant.

The plant operated by Mr. Thos. E. Martin, manufacturer of drain tile, at Thamesville, Ont., has commenced the manufacture of wire cut brick again.

The Brigden Brick & Tile plant, at Brigden, Ont., which was closed down for eighteen months has been reopened by a new company known as the Ontario Farmers Drainage Co. Ltd., of which Mr. Andrew Hicks is president. Several extensions to the plant are being made and all new machinery will be installed. Mr. Robert McDonald is the manager and Mr. C. S. Parks, service manager, the latter with office at 110 Dundas St., London.

The S. E. Dinsmore Company have the general contract for the erection of a $400,000 power plant for the Ford Motor Company of Canada, at Ford, Ont. This building will be the largest of its kind in Canada, with dimensions of 148 x 112 ft., with walls to a height of 100 ft. It will be of steel, reinforced concrete and brick construction and will be equipped with $1,500,000 of power machinery.

Bowles Lunch, Ltd., will build a duplicate of their present King St. building, Toronto, next door to the present building on a site now occupied by L. J. Applegath & Sons, 11-13 King St. E. The new building will be three-storeys high, 28 x 100 ft., of fireproof construction throughout, with terra cotta front and marble and tile trim, the same as the present structure, but will be completely separated from it.

A drive to secure funds for the erection of a five-storey wing to St. Michael's Hospital, Toronto, will be launched by the Board of Governors in September. The sum of $500,000 will be needed for this building, which will be used for the accommodation of the out-patients and for pathological work. The new building will have a frontage of 500 ft. on Victoria Street.

Messrs McGratton & Sons, of St. George, N. B., will supply the cut granite blocks for facing the gates, etc., of the new St. John dry dock. Some of these blocks will weigh as much as 5 and 6 tons.

Mr. Harry A. Mallory has the contract to build $50,000 New Tabernacle Baptist Church, at Haymarket Square, St. John, N. B.

A newly incorporated company, The Terminal Grain Co., at Vancouver, B. C., are planning the construction of a $250,000 structure as the first unit of a large elevator there. R. H. Gale is president of the new company.

The General Motors, at Oshawa, have let the contract for a new assembly building, 600 x 100 ft., of steel, brick and concrete construction, and another new building immediately west of the present office building, to serve as a maintenance station or demonstration depot, is planned. The latter structure will be one and a half storeys high, 200 x 100 ft.

Work has been commenced on the $80,000 high school at Paris, Ont. Schultz Bros., of Brantford, have the contract and it is expected the building will be ready for occupation by the first of the year.

The city council at Hamilton recently approved of a $600,000 debenture issue for the new East-end collegiate and also $65,000 for alterations and repairs to the Cannon St. school.

Supplementary estimates brought down in the House recently included an item of $75,000 for dredging at the Harbor, Owen Sound, Ont., which was passed by the government.

Personal

Mr. R. Home Smith, chairman of the Toronto Harbor Commission, returned recently from a trip to England.

Mr. Jos. Rupp has disposed of a marble and granite business at Forest, Ont., to Mr. R. Alpaugh.

Obituary

Mr. Joseph Gaston Legrand, aged 62, bridge engineer on the western lines of the Canadian National Railway, died at his home in Winnipeg recently. Mr. Legrand came to Canada from France in 1891 and was appointed bridge engineer of the Grand Trunk Pacific in 1906 and came to reside in Winnipeg two years later. In 1920 he was promoted to the position he held at his death. During the intervening years he supervised the design and construction of bridges aggregating in value $12,000,000. Among engineering works he designed was the Provencher avenue bridge and he later advised, in the capacity of consulting engineer, on the renewal of Maryland street bridge. Mr. Legrand was a member of the council of the Engineering Institute of Canada from 1909 to 1912, chairman of the Winnipeg branch of the Engineering Institute of Canada, 1912 to 1914, president of the Western Canada Railway club, 1913-1914; vice-president of the Association of Professional Engineers of the province of Manitoba, 1920-1922, and was a member of the American Railway Association. He was a member of the Canadian Club, Wninipeg Automobile Club, Winnipeg Golf Club. and Winnipeg Rowing Club.

Trade Incorporations

Mountain Stone Co. Ltd., with head office at Fort William. Ont., capital $200,000, to carry on a stone quarrying business and to deal in builders supplies.

Ottawa Gravel & Construction Co. Ltd., with head office at Ottawa, capital $50,000, to carry on a building business and to deal in gravel, concrete, brick, etc.

Atlas Construction Co. Ltd., with head office at Toronto, capital $40,000, to carry on a general contracting business.

Duntile Co. Ltd., with head office at Montreal, capital $150,000, to manufacture tile, brick, drain and sewer pipe, etc.

CONSTRUCTIONAL ACTIVITY

Period of July 11 to July 17, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Batiscan, P. Q.
R. Morrissette, C. E., De la Madeleine, P. Q., wants prices on small pumping outfit, 40 ft. head, 1½ in. diameter, also gasoline motor, for La Cie [illegible], Batiscan.

Bosanquet Township, Ont.
The township council plans the construction of the Elliott McBryan drain and repairs to the Stubbs drain. Clerk, Geo. Sutherland, Thedford, Ont.

Dundas, Ont.
Plans are being prepared by the town council for a sewer on South St. Consulting engineer, E. R. Gray, Hamilton. Tenders will be called shortly.

Gosfield S. Township, Ont.
Tenders will be received by clerk, J. H. Coatsworth, Kingsville, Ont., until July 28th, for McDonald drain, tile and open work. Plans and specifications with clerk.

Hamilton, Ont.
The city council contemplate the paving of Ottawa St., from Main St. to Mountain St., as soon as the water mains have been laid. Engineer, W. L. McFaul.

Plans are being prepared for the laying of water main on Ottawa St., from Main to Mountain St.

Port Dalhousie, Ont.
Tenders are being received by the clerk, G. Wismer, St. Catharines, until July 20, for the construction of 14,000 sq. yds. of concrete base and surface curb and gutters, catch basins, on Main and Ontario streets, for the Lincoln County Council, St. Catharines. Plans and specifications are with the engineer, F. N. Rutherford, 24 Queen St., St. Catharines, Ont.

St. Bruno-Roberval-St. Bruno Rd., P. Q.
The Provincial Department of Roads will receive tenders, through the Deputy Minister, J. L. Boulanger, Parliament Bldgs., Quebec for gravelling roads in the following municipalities: St. Methode, 26,400 ft.; Normandin Township, 13,400 ft.; Albanel Township, 1,584 ft. Engineer, G. Henry, Parliament Bldgs., Quebec, P. Q.

Stamford Township, Ont.
The township council will submit bylaw to the ratepayers shortly for the expenditure of approximately $281,571 on the township's sewer system. Engineer, M. Kerr, Township Hall, Ferry St., Niagara Falls. Clerk, T. R. Stokes.

Toronto, Ont.
Tenders are being received until noon Aug. 21, by the Chairman of the Board of Control, C. A. Maguire, for supply and installation of two 2,880,000 Imp. gal. centrifugal sewage pumps and motors at the Strachan Ave., sewage disposal station. Specifications, etc., at Room 12, City Hall.

CONTRACTS AWARDED

Chateauguay Bassin, P. Q.
O'Connor's Ltd., 20 St. Nicholas St., Montreal, have a contract for paving in the above town, at $15,000.

Creston, B. C.
The DeWolf & Ham Construction Co., Cranbrook, B. C., have the contract for roadwork on the Erickson-Creston Road, for the Provincial Dep't. of Public Works, at $25,000. District Engineer, Wm. Ramsay, Creston, B. C.

Ford, Ont.
The city council has awarded Merlo, Merlo & Ray, Ltd., the contract for a separate sewer system on Drouillard Rd., from Essex Terminal tracks to Tecumseh Rd., at $27,751, and also the contract for a separate sewer system on Pilette Rd., from the G.T.R. to Tecumseh Rd., at $68,473.

Goulbourn Township, Ont.
H. A. McDonald, 36 Bank St., has been awarded the contract for one mile of bituminous macadam pavement between cons. 3 and 4 in the above township, by the Carleton County Council. Engineers, Patterson & Byrne, 71½ Sparks St., Ottawa.

Grantham Township, Ont.
The township council has awarded the tender for 3 in. watermain on Vine St., to Thomas Riley, 106 King St., St. Catharines. Engineer, F. N. Rutherford, 24 Queen St., St. Catharines, Ont.

Halifax, N. S.
The Stephens Construction Co., 124 Prince William St., St. John, N. B., has been awarded the contract for laying concrete base and bituminous macadam pavement on Quinpool Rd., from Windsor St. to Oxford St. and a section of South Park St., at $60,000.

Kitchener, Ont.
The Standard Paving Company, Central Chambers, Ottawa, have been awarded the contract for 2,000 sq. yds. of concrete and 10,000 sq. yds. of asphalt pavement at Kitchener, Engineer, S. Shupe.

Montreal, P. Q.
The city council has awarded the contract for paving Delanaudiere St., from Laurier to St. George, to the Sicily Asphaltum Paving Co. Ltd., 50 St. Viateur St., at $14,497.50, also contract for paving De La Roche St., from Gifford to Laurier Ave., at $15,528.

Messrs. Quinlan Robertson & Janin, Ltd., 50 Notre Dame St. have been awarded contract for paving 1st Ave., Rosemount, at $89,530. Work is to start at once. City Clerk, Rene Bauset.

Messrs. St. George & Gauvreau, Ltd., Mappin & Webb Bldg., have been awarded contracts for the building of sidewalks on Poloquin St., from River des Prairies to 42nd Ave., at $313,671. Work will commence at once. Clerk, Rene Bauset.

Duranceau & Duranceau, Ltd., 152 Hamilton St., have the contract for the paving of the following streets: Resther St., from Gilford to Laurier Ave., at $9,686.60; Mentana St., from Gilford to Laurier Ave., at $9,389; Adam St., from Dezery St. to Covellier St., at $17,407.50. This firm also has contract for the building of sidewalks on Orleans St., from Vermette to Rosemount Blvd., at $45,952.50.

Contract for the paving of Mouseau St., from Notre Dame St. to Tellier, has been let to Bernard Brault, Ltd., C. P.R. Yards, at $11,946. Clerk, Rene Bauset.

Bernard Brault, Ltd., C. P. R. Yards, have been awarded the contract for paving St. Dominique St., from Fairmount to Bernard Ave., at $40,148.

Messrs. Quinlan, Robertson & Janin, Ltd., 50 Notre Dame St. W., were recently awarded the contract for paving Girouard Ave., from Sherbrooke St. to Notre Dame de Grace Ave., at $38,207.50.

Duranceau & Duranceau, Ltd., 152 Hamilton St., have the contract for paving Boyer St., from Gilford to Laurier Ave., at $13,163.20.

Regina, Sask.
Messrs Gibbs Bros., Lumsden, Sask., have the contract for roadwork between Regina and Pense, a distance of 17 miles, for the Prov. Dep't. of Highways, Regina. The work will cost about $18,000.

Messrs. Laurie & Lamb, Montreal, are supplying four Fidian wheel travelling distributors for the pumping plant at Regina, Sask. The contract for the installation of this additional equipment will be let later.

Tisdale, Sask.
Work will be commenced at once by Hett & Sibbald, Prince Albert, Sask., on road from Tisdale north, for the Prov. Dept. of Highways, Regina, involving an expenditure of $11,000.

West St. John, N. B.
The city council has let the contract for trenching and laying of water main to the Stephens Construction Company. The General Supply Co. of Canada, Ltd., have the contract for pipe extension.

Railroads, Bridges and Wharves

Carman, Man.
Mr. F. W. Kirby, secretary-treasurer of the Municipality of Dufferin, Carman, Man., will receive tenders until Saturday July 21 for the construction of three concrete bridges. Specifications and plans may be obtained from the secretary-treasurer or at the office of the Highway Commissioner, 315 Parliament Bldgs., Winnipeg, Man.

Chatham and Glenelg, N. B.
The Prov. Dep't. of Public Works, through the Deputy Minister, P. J. Veniot, Parliament Buildings, Frederic-

ton, will receive tenders until July 25, for the construction of a bridge over Napan River. Plans and specifications with Department at Fredericton; Provincial Government Rooms, St. John, N. B.; Fred A. Fowlie, M.L.A., Little Branch, Northumberland County and office of J. S. Martin, Chatham, N. B.

Cobourg, Ont.
Tenders are being received by the Dom. Dep't. of Public Works, through the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, until Aug. 2, for the construction of 170 lin. ft. of pier superstructure here. Plans and specifications are with the district engineers, Equity Bldg., Toronto; Royal Bank Bldg., London, Ont.; and at the post office at Cobourg, Ont.

Goulais Bay, Ont.
Work has almost been completed on railroad line for the Thielman Forest Products Lumber Co., 494 Queen St. E. Sault Ste Marie, and a start will be made at once on roundhouse. Engineer in charge, W. R. Williamson, c/o the above firm.

Point-au-Pic, P. Q.
The Dom. Dep't. of Public Works, through the secretary, R. C. Desrochers, Parliament Buildings, Ottawa, is calling for tenders until noon, Aug. 2, for repairs to wharf at Murray Bay, Point-au-Pic. Plans and specifications with the department, Ottawa; at office of the district engineer, Post Office Bldg., Quebec; Shaughnessy Bldg., Montreal, and post office, Point-au-Pic, P. Q.

Victoria County, Ont.
Tenders are being received until noon. July 20, by the county engineer, E. L. Miles, Lindsay, Ont., for repainting and cleaning the following steel bridges; Cown's Bridge, lot 11, Con. 6, Emily Twp.; Little Bob Bridge, Lot 14, Con. 10, Verulam Twp.; Forest House Bridge, Village of Bobcaygeon; North Bridge, village of Bogcaygeon. Plans and specifications with engineer.

CONTRACTS AWARDED

Dorchester, Ont.
The Hamilton Bridge Works Co., Hamilton, has the contract for bridge here, for the Middlesex County Council. W. Crellin, Kintore, will build the abutments and lay the cement floor.

Hamilton Twp, Ont.
W. G. Gibson, Port Hope, Ont., was awarded the contract for the building of 4 concrete bridge culverts, at various points in the township, at $2,350. Clerk, W. J. Grieve, Camborne, Ont.

Moulton Township, Ont.
Britnell Contracting Co. Ltd., Baxter St., Toronto, have the general contract for a concrete truss bridge over Oswego Creek, for the Haldimand County Council. Clerk, Harrison Arrell, Caledonia, Ont. Engineer, Frank Barber & Associates, Ltd., 40 Jarvis St.

St. Basil, N. B.
The contract for the steel superstructure of the "Green River" bridge here has been let by the Prov. Dep't. of Public Works, to the MacKinnon Steel Co. Ltd., Industrial St. Sherbrooke, P. Q., at $12,000 The bridge will be a one span structure, 157 ft. 6 in. Contract for reinforced concrete flooring, with wearing surface of creosoted blocks will be let later.

West Garafraxa, Ont.
The following contracts have been awarded by the township council of West Garafraxa; Belwood Culverts, Langdon & Batho, Fergus, Ont., $600; Bain Bridge, Quinn & Wilson. Fergus, $1,100; Swifts Bridge, W. B. Vallery, Belwood, $1,000; retaining wall, Mario & Langdon, Fergus, $1,500. Engineers, A. W. Connor & Co., 34 Victoria St., Toronto.

Public Buildings, Churches and Schools

Aylmer, P. Q.
The Hillcrest Golf & Country Club are contemplating the erection of a large club house on Aylmer Rd. President of the club is Mr. Frank H. Plant, Mayor of Ottawa.

Claremont, Ont.
The local school board are receiving tenders, through the architects, Walker & Gibson, 70 Victoria St., Toronto, until July 27, 5 p.m., for a school building estimated to cost $30,000. Plans and specifications are with the architects.

Leaside, Ont.
Tenders being received by the secretary of the local school board, Thos, Johnson, until July 25, for school building estimated to cost $65,000. Two storeys and basement, 4 rooms and auditorium, brick construction. Plans with architect, S. B. Coon & Son, 4 St. Thomas St., Toronto.

London, Ont.
Tenders are being received by the architect, John M. Moore, 489 Richmond St., for a parish hall for St. George Anglican Church here, estimated to cost $18,000.

Niagara Falls, Ont.
The Niagara Falls Arena, Ltd., will call tenders in about a week for an ice arena, 1 storey, 85 x 185, of brick and hollow tile construction, coated with stucco, to have a seating capacity of 4,000.

Ottawa, Ont.
J. Albert Ewart, Jackson Bldg., is preparing plans for technical school for the Ottawa Collegiate Board, to be located on Albert St.

St. Stephen, N. B.
The local school board are contemplating the construction of a $10,000 high school here. Secretary, J. Vroom. Chairman, N. Marks Mills.

Scarboro Township, Ont.
Tenders will be called shortly by the architect, J. M. Cowan, 991 Bay St., for an addition to college building for the China Missions Corporation, at stop 28 Kingston Road, estimated to cost $80,000. The building will be three storeys and basement, 40 x 140 ft., of steel, stone and brick construction.

South Porcupine, Ont.
Tenders are being received by the secretary of the local school board, Mr. Max Smith, until July 21, for the construction of a school building on Crawford St. Two storeys, 6 classrooms, gymnasium and auditorium, estimated to cost $65,000. Plans and specifications with architect, A. H. Cederberg, Timmins, Ont.

Toronto, Ont.
The High Park Methodist Church has decided to postpone the building of a sunday school, owing to tender being too high. The plans will be revised. Architects, Belfry & Wilson, 2 Bloor W.

The Sisters of Loretto, 403 Wellington St. W., have purchased a 10-acre site for their new $500,000 abbey just south of York Mills, North Toronto. Arch. J. P. Hines, 73 King St. W.

Valleyfield, P. Q.
The general contractor, Theodore Belanger, has just commenced alterations to school building here, costing $29,000. Architect J. O. Turgeon, 55 St. Francois Xaxier St., Montreal.

Weston, Ont.
Messrs. Hall & Duerr, architects, Lumsden Bldg., Toronto, have been appointed to prepare plans for new $60,000 theatre at Weston, Ont., for a new company recently organized there. Building will be 2 storeys, of brick construction, with seating capacity of 750 and will be located on Main street.

Windsor, Ont.
Tenders are being received by D. Gourd, 616 Pierre St., secretary of the local Separate School Board, until July 24 for the erection of a school building, estimated to cost $160,000, on Campbell Ave. The building will be 2 storeys, 85 x 109, containing 8 rooms, and of brick and tile construction. G. J. P. Jacques, 3 Ouellette Ave., is the architect, and plans and specifications may be seen at his office

Woodstock, Ont.
Tenders will be called shortly for an 8-room addition to the Central School, Woodstock. Architect, J. H. Grenfell, Woodstock.

CONTRACTS AWARDED

Assiniboia, Sask.
The general contract for a girl's school at Assiniboia has been let by the Women's Missionary Society of the Presbyterian Church in Canada, to Bird & Woodall, Moose Jaw, Sask., at $12,415. Secretary of the Society, Mrs. R. D. Coutts, Assiniboia.

Brockville, Ont.
The following sub-trades have been let in connection with $20,000 office building for C. S. Cossitt, at Court House Ave. and King St.; masonry and steel, W. Pattison, Prescott Rd.; Carpentry, roofing, electrical work, plastering and sheet metal, G. E. Parslow; plumbing and heating, Geo. Ross & Co., 5 King St. E. Architect, A. Stuart, Allaster.

Cooksville, Ont.
Patterson Electric Co., 615 Yonge St., Toronto, have the electric contract on the new $20,000 school building built by the local school board on Huron St. Balance of the sub-trades, including structural steel, roofing, sheet metal work, plumbing, heating, plastering, painting and glazing will be let. G. E. Edgar S. Warn, 3 Locust Ave., Mount Dennis, Ont.

Edmonton, Alta.
The general contract for the erection of a school building for the Edmonton Separate School Board has been let to J. P. Desrochers, 10,747-93rd. St., at $24,395. The plumbing and heating con-

tract has been let to J. P. Fitzgerald, [illegible] St., Edmonton.

Hamilton, Ont.
The Board of Education, City Hall, has let the general contract for alterations and addition to the Cannon St. School to Stuart Bros., 13 Hyde Park, at $42,180 The plumbing and heating contract was let to Adam Clarke, 7 Main St. W., at $14,300. Sec. R. H. Foster.

Kitchener, Ont.
The National Fireproofing Co. of Canada, Ltd., Dom. Bank Bldg., Toronto, will supply Natco hollow tile for the annex to the Windsor Hotel, on Young St., owned by Ed. Lippert. This is a 3-storey addition, 35 x 45 Electric, heating and plumbing sub-trades will be let.

Lakeview, Ont.
The following sub-trades let recently in connection with $45,000 school being built at stop 32½ Lake Shore Rd., for S. S. No. 7, Toronto Township: plumbing, J. Mahon, Port Credit; heating, Harry Griffiths & Co., 1128 College St., Toronto. Tenders are wanter for the electric work, lathing and plastering. Architect, C. M. Hare, Room 22-70 Victoria St., Toronto.

London, Ont.
The Peoples Electric Co., 656 Dundas St., have the electric contract and Noble & Rich, 237 Queens Ave., the plumbing contract for new $50,000 Registry Office on King St. for the city of London.

Montreal, P. Q.
J. C. Frechette, 224 Breboeuf St., has the general contract for the erection of a school building for the R. C. School Commission, Eastern District, 2367 Adam St. Architects, Bernier & Despatie, 294 St. Catherine E. The roofing, electric, plumbing, heating, plastering, painting, millwork, marble and tile contracts will be let.

Oakley, Ont.
Mr. Harvey Manning, R. R. No. 1, Harrow, has the contract for the remodelling of school building for the Public School Board here. Architect, Thos. Jenner, Harrow. This work will involve an expenditure of $8,000.

Quebec, P. Q.
L. H. Peters, Ltd., 10 Ste Angele St., has the general contract for addition to the Ecole des Beaux-Arts, on St. Joachim St., costing $9,000. The addition consists of one storey on the rear of the present building and new portica in front.

St. Anthony, N. B.
The electric and plumbing contract on the new $50,000 R. C. church here has been let to Ourelle Legere, Moncton, N. B. Altars, fittings, etc., to be purchased.

St. Catharines, Ont.
Newman Bros., 75 St. Paul St., have been awarded the general contract for alterations and addition to sunday school building for Queen St. Baptist Church, costing $35,000. The following sub-trades were also let: plastering, Geo. Wood, Chaplin Ave.; carpentry, C. F. Monk, Glen Ridge Ave.; glazing, Lincoln Art Glass Co., 225 St. Paul St.; roofing, J. Nichol & Sons, 65 Queen St. Sheet Metal, electric, heating, plumbing and painting to be let by architect, Nicholson & Macbeth, 46 Queen St.

St. Charles, P. Q.
Contract for the heating of new church for the R. C. Parish here has been let to H. Letourneau, 265 Cascades St., St. Hyacinthe, at $4,899.

St. Ephrem D'Upton, P. Q.
Messrs. Vincent & Fils, Acton Vale, P. Q. have the general contract for addition to convent here for the local School Board, costing $50,000. The MacKinnon Steel Co. Ltd., 10 Cathcart St., Montreal, are supplying the steel.

St. Raphael, Ont.
Mr. Horace Dufresne, 44 St. Mathew St., St. Laurent, near Montreal, has the general contract for a $40,000 convent building for the Parish of St. Raphael and he will let sub-trades. Architect R. Gariepy, 15 St. James St. Montreal.

Sault Ste. Marie, Ont.
J. J. Fitzpatrick, 127 Church St., has the general contract for the new Gibson Memorial Nurses Home, at $35,000. The building will be 3 storeys and basement, 30 x 58, of brick construction.

Sydney, N. S.
The plumbing and heating contract in connection with new $45,000 Nurses' Home being built for the local Hospital Commission, has been let to Bayer & Co., George St. The electric, plastering, painting and glazing contracts have not been let. Architect, A. H. McCormack, Ross Block. Secretary, M. M. Andrews.

Thessalon, Ont.
Geo. P. Sandie. Thessalon, has been awarded the contract for building school here for the local school board, at $32,000. Architect, T. R. Wilks, 612 Queen St. E., Sault Ste. Marie, Ont.

Toronto, Ont.
The plastering contract in connection with $55,000 church building being built on Shaw St., for Christ Church R. E., has been let to Robertson & Findlay, c/o the architects, Gordon & Helliwell, Confederation Life Bldg.

The following sub-trades have been let in connection with two stores and apartments building built on Dundas St. W.; carpentry, Osher & Kirger, 4 Bellevue Ave.; roofing, Toronto Sheet Metal Works, 36 D'Arcy St.; plumbing, J. Shogiler, 559 Bay St. Plastering, painting, heating and electric contracts have not been let yet. The architect is B. Swartz, 336 Dundas St. W.

A. H. Read, 692 Shaw St., has the heating contract for $10,000 office structure being built by Wm. McGill Coal Co., 1143 Yonge St. Gen. Contractor is R. G. Kirby, 539 Yonge St.

The city of Toronto has awarded the heating contract in connection with reception hospital at Surrey Place, to Fiddes & Hogarth, 122 King St. E. This building is costing $368,777.

Uxbridge, Ont.
The electric contract for the $75,000 school building being erected by the local school board on Third Avenue and Plank St., has been let to Jack Bustard, and the painting contract to Lunstell Bros., both of Uxbridge. Carpentry and masonry is being done by day labor. The plastering contract has not yet been let. Architect, D. R. Franklin, 587½ Yonge St., Toronto.

Business Buildings and Industrial Plants

Granby, P. Q.
Mr. W. Blanchard is contemplating the erection of a store and residence at 6 Court St., to cost $8,500.

Lime Ridge, P. Q.
The Dominion Lime Co., Lime Ridge, contemplate the building of a mill for burning lime here, at a cost of $10,000. Conc. foundation, corrugated iron construction, steel frame.

Montreal, P. Q.
F. Dansereau, 216 Hampton Ave., is contemplating the erection of 16 garages on Hampton Ave., between Sherbrooke and the C.P.R., each to be 1 storey, 10½ x 21 ft. of brick construction and gravel roofing.

Tenders are wanted by the general contractors, Bonnell Bros., 341 Guy St., on the flooring, electric work, plumbing, heating and stable fixtures for the $25,000 stables they are building on Rioux St., for the Ogdenberg Coal & Towing Co., 184 McCord St., Prices are also wanted on about 50,000 common brick. The building will be 2 storeys, 130 x 84, of brick construction.

L. P. Dion, 1178 St. Denis St., is altering residence on this street into stores and offices, at an estimated expenditure of $8,000. Tenders are wanted at once bythe architect. J. T. Huot 304 University St., for heating.

Messrs. Bigonesse & Bigonesse, 182 St. Catherine St. E., are preparing plans for alterations to the Franco-American Dental Institute building at 162 Denis St., estimated to cost $15,000. Tenders will be called in about a week's time. The owners also contemplate a $25,000 addition to this building when the above alterations have been completed.

Plans are being prepared for an addition to warehouse at Piers 26 and 27, for the Harbor Commission, 57 Common St. Manager, W. P. Fenwell Jr., 57 Common St. Tenders will be called shortly.

Ottawa, Ont.
Tenders are being received by the general contractor, Graves Construction Co., Jackson Bldg., Bank St., for electrical work, plumbing and heating in connection with $40,000 office building they are erecting on Queen St., for the Citizen Building.

Sarnia, Ont.
Excavating has been commenced on 4 stores and offices at the corner of Christina and Cromwell Sts., costing $35,000, for Dr. J. F. James, 123 Christina St.

Toronto, Ont.
Loblaws Groceterias Co. Ltd., 130 King E., have purchased a site for a $100,000 warehouse and will commence construction shortly. This site is on St. Helens Ave., near Dundas.

The architects, N. A. Armstrong Ca. Ltd., 7 King St. E., will let the plumbing heating, wiring and ventilating contracts in connection with proposed new $150,000 lunch room which Bowles Lunch Room, Ltd., 7 King St. E., will build next door to the above address. General contractor is W. T. Joy, 86 High Park Ave.

Mr. B. Swartz, 336 Dundas St., architect, will receive tenders on all trades in connection with the building of a store and garage, estimated to cost $12,000, on St. Clair Ave.

Messrs. Sproatt & Rolph, architects, 1162 Bay St., are receiving alternative tenders as follows: (1) new building, 2 storeys and basement; (2) new building, 1 storey and basement; (3) new building, 2 storeys and basement and rebuilding existing structure, at 7 Labatt Ave., for the Crouse Hinds Co.

Windsor, Ont.

Electric, plumbing and plastering contracts will be let in connection with 3 stores, valued at $12,000, being constructed on Ouellette Ave., for A. A. Little, Pitt St. W., by Fred Prince, 208 Davis Bldg.

CONTRACTS AWARDED

Dorchester, Ont.

The general contractor on a new branch for the Bank of Toronto, at Dorchester, Ont., is Wm. Collier, 49 Helendale Ave., Toronto. He will supervise all work and let sub-trades.

Hamilton, Ont.

Messrs. Pigott-Healy Construction Company, 36 James St. S., are mentioned as the probable contractors for the 8-storey Lister Bldg., to be erected on James St. N., for J. E. Lister, Old Spectator Bldg. B. H. Prack, Bay St., Toronto, is the architect.

London, Ont.

John Hayman & Sons, 432 Wellington St., have the contract for the erection of an office building to cost $10,000, on Richmond St. W., for the Wm. Martin Coal Co., 717 Richmond St. Messrs. Watt & Blackwell, Bank of Toronto Bldg., are the architects.

Montreal, P. Q.

Painting contract in connection with $100,000 warehouse being built on Craig St., for A. Prudhomme & Fils, Ltd., 10 de Bresoles, has been let to Mr. Lemous, c/o owners. Tenders are being received by the general contractor, Art. Leduc, 351 Christophe Colomb St., for freight elevator. Five-storey bldg., 97 x 110 ft.

J. Brazeau, 364 University St., has awarded the general contract for an addition to the plant of the Benellac Lithographic Co., at Beaver Hall Hill, costing $25,000 This building will be 2 storeys, 56 x 37. G. C. will let sub-trades.

Messrs. Purdy & Henderson, 410 Mappin & Webb Bldg., have the general contract for repairs and addition to branch bank at the corner of St. Mathew & St. Catherine St., for the Royal Bank of Canada. 147 St. James St., at $10,000. This will be a 3-storey bldg., 25 x55 ft.

The following sub-trades have been let in connection with a $40,000 machine shop at the Montreal Harbour for the Harbour Commission, being built by Messrs. Quinlan, Robertson & Janin: steel: Dominion Bridge Co. Ltd., Lachine, P. Q.; plumbing and heating, Turcot Ltd., 1681 Clarke St.; steel sash, Trussed Concrete Steel Co. Ltd., 1043 Canada Cement Bldg.; brickwork is being done by day labor.

H. Truchon, 210 Plessis St., has the electrical contract and R. D. Clark & Sons, 26 Lincoln St., contract for the plastering work in connection with departmental store being built by Dupuis Freres, Ltee., on St. Catherine St. E. Architects, Archambault & Leclaire Ltd., 71a St. James St.

Nicolet, P. Q.

Messrs. Caron & Fils, Nicolet, were awarded the general contract for the erection to a bank and offices here for the Banque D'Hochelaga, Head Office 112 James St., Montreal, at $15,000.

Ottawa, Ont.

Stan Lewis. 63 Metcalfe St., has the contract for the electric work, and W. J. Carson, Laurier Ave. E., contract for the painting and glazing in connection with $150,000 office building on Sparks St. being built by the Sparks Estate, 193 Sparks St. J. Albert Ewart, Jackson Bldg., Bank St., is the architect.

Saskatoon, Sask.

Mr. H. J. Tubey, 108½-3rd. Ave., N., Saskatoon, has the general contract for the erection of a $14,000 warehouse for the National Trust Co., at 306 Pacific Ave. The building will be one storey 30 x 103, of brick construction. Wheaton Electrical Co., 263-2nd Ave. S., have the electric contract and the plumbing will be done by Beaton & Brady, 235-20th St. E. Sheet metal, plastering, painting, roofing and steelwork contracts have not yet been let.

Sault Ste. Marie, Ont.

The Golden Grain Bakery, 52 Wellington W., have awarded the general contract for an extension to their bake shop at this address, to McLarty Bros., 38 Wellington St. The building will be 2 storeys, 40 x 60 and will cost $12,500. The plumbing and heating contract has been let to J. McLeod, 143 Alexander St. and the electric contract to Taylor Bros., Gore St.

Toronto, Ont.

L. E. Dowling, 167 Yonge St., has the general contract for a $30,000 machine shop at 773 King St. W., for J. G. Pendrith, 970 Queen St. W. The building will be 2 storeys, 56 x 142 of brick construction.

Following sub-trades have been let in connection with the $750,000 addition to the departmental store of the Robert Simpson Co. Ltd., at the corner of Queen and Yonge Sts.: electrical, Canadian Comstock Co., 110 Cathcart St., Montreal; plumbing, heating and sprinklers, Purdy Mansell, Ltd., 63 Albert St., Toronto.

Tenders are in for the 8-storey office building and automatic exchange for the Bell Telephone Company, at Sheppard & Temperance Sts., and the following are probable contractors on the work: masonry: Jas. A. Wickett, Ltd., 16 Saulter St.; cut stone, Geo. Oakley & Son, 278 Booth Ave.

Residences

Cooksville, Ont.

A company known as Lands Development, Ltd., 1178 Bay St., Toronto, is being organized and propose erecting 25 residences and several stores at Cooksville. Capt. W. Orr, 21 Surrey Place, Toronto, is one of the interested parties in this development.

Hamilton, Ont.

Tenders are being received by C. H. Dyment, 895 King St. E., for all subtrades in connection with $49,000 residence being built by him on Proctor Blvd.

Kitchener, Ont.

The electric, plumbing and heating trades for four residences being erected on Samuel St., for George Berdux, Samuel St., will be let immediately by the general contractors, Forler Bros., Phillipsburg, Ont.

Leaside, Ont.

Tenders are being received by the architect, B. Swartz, 336 Dundas St., for all trades in connection with residence to cost $7,000, for W. A. Brown. Owner's address c/o architect.

London, Ont.

W. G. Murray, architect, Dominion Savings Bldg., is preparing plans for $30,000 apartment building on Wolfe St., for Dr. C. J. Karn, 556 Waterloo St.

Limoilou, P. Q.

L. H. Gaudry, Ltee., 25 Sault au Matelot St., have just commenced the construction of an 8-family residence on Ide St. Ours St., to cost $50,000.

Montreal, P. Q.

Tenders are wanted at once by Max Brucker, 367 St. Catherine St., for the following sub-trades in connection with $60,000 apartment house he is building on Stanley St.: roofing, electrical, plumbing, heating, plastering, painting, millwork, brickwork, telephone system, dumb waiters, marble and tile work.

J. H. Demers, 566 Marquette St., is building 5 residences on Marquette St., between Laurier & St. Gregoire St., costing $40,000. He will let the roofing, electric, plumbing, heating and plastering trades.

The electric, plumbing, plastering and brickwork contracts in connection with 2 residences being built on Casgrain St., by H. Lavoie, 94 Laurier E., have not been let yet. These houses are valued at $16,000.

G. H. Robert, 2409 Christophe Colomb St., will probably go ahead with the erection of 2 residences on Berri St., costing $25,000, in about a month's time.

Tenders are wanted at once by Chas. Daoust, 393 St. Philippe St., for roofing, electric work, plumbing, plastering, brickwork, and millwork in connection with residence which he will build on Colbrook St. Architect, P. L. W. Dupre, 20 St. James St.

E. St. Onge, 1895 De Laroche St., will let the masonry, roofing, electric, plumbing, plastering and painting trades in connection with $6,000 residence he is building on Berri St.

Tenders are wanted on the following sub-trades in connection with $6,000 residence being built on Galt Ave., for A. Sauve, 1314 Galt Ave.: roofing, electric work, plumbing, plastering and millwork. General contractor, C. Barbeau, 1605 De L'Eglise Ave.

J. Gilletz & Co., 1188 City Hall Ave., will let the roofing, electric, plumbing, heating, painting and millwork contracts in connection with a $15,000 residence they are building on Mance St.

Tenders as received by E. Latourelle, 43 Cote d'Armee, for apartment house on Sherbrooke St. W., were too high. New tenders will be called in few days.

Mr. Alcide Chausse, 70 St. James St., is preparing plans for a 4-family residence on Laurin Ave., for Mrs. F. Delorme, 12 Picard Lane, Montreal. Tenders to be called in a few days.

(Continued on page 54)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

To Contractors

Sealed bids will be received by the undersigned [illegible]

Saturday, July 28th, 1923,

[illegible] all trades required in the erection of a residence in Bayfield St., Barrie, Ont.

The lowest or any tender not necessarily accepted.

F. S. BAKER, Architect,
Bank of Hamilton Bldg.,
29 TORONTO, Ont.

TENDERS

Bulk or separate tenders will be received by the undersigned for all trades required for the erection and completion of a High and Vocational School Building for the Beamsville Board of Education, until five p.m.

Monday, July, 23, 1923,

The lowest or any tender not necessarily accepted.

Plans, specifications and information may be obtained from Nicholson & Macbeth, Architects, 46 Queen Street, St. Catharines, Ontario.

J. H. SINCLAIR, Sec.-Treas.,
Board of Education,
28-30 Beamsville, Ont.

DEPARTMENT OF ROADS

TENDERS

Iberville-St. Albans and Laprairie-Valleyfield Highways

Tenders made on forms supplied by the Department of Roads and placed under envelopes bearing the word: "Tender," followed by the name of the highway and municipality concerned, shall be received at the office of the Minister of Roads, in the city of Quebec, Government Building until twelve o'clock of the afternoon (Eastern Standard time), on

Tuesday the seventh (7th) of August, 1923,

for the construction of an oiled waterbound macadam on the following highways: Iberville-St.-Albans in the municipalities of the parishes of St. Athanase, 13796 feet, and Ste. Anne of Sabrevois, 6341 feet; and Laprairie-Valleyfield in the municipalities of the village of Lac St. Louis, 21825 feet, and of the parish of St. Timothee, 10955 feet.

The Government of the Province of Quebec does not bind itself to accept any of the tenders. Quebec, July 16th, 1913.

J. L. BOULANGER,
Deputy Minister.

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra.. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

TOWN OF WESTON

TENDERS

Sealed tenders, plainly marked as to contents, will be received by the undersigned up to 6 o'clock P.M. on

Tuesday, July 24th, 1923,

for the supplying of the following materials: -

Quantity	Description
37,000 lbs. of	Special Castings
981 lengths of	6" Cast Iron Pipe.
52	6" Stop Valves.
52	Valve Boxes.
25	Hydrants.

Specifications, form of tender and further information may be obtained upon application.

A marked cheque made payable to the Municipal Corporation of the Town of Weston for 5% of the amount of the Contract price must accompany each tender.

The lowest or any tender not necessarily accepted.

The Council reserves the rights to divide contracts as it sees fit.

H. L SEYMOUR,
Municipal Engineer,
29 52 Main St., Weston

Alterations to School

Cherrywood, Pickering, Ont.

Sealed tenders for supplying of all labor and material, equipment and tools required for alterations to School situated in the Village of Cherrywood, Township of Pickering, County of Ontario, will be received by the undersigned up until three o'clock

July 14th, 1923,

Each bid must be marked signed by bidder accompanied by a certified cheque on a chartered bank for 2½% or bid bond for 2½%. Tenders shall be mailed in sealed envelopes clearly marked with Bidder's name and trade.

Plans and specifications may be seen at the Post Office, Cherrywood or at the office of MacLeans Building Reports, 345 Adelaide St. West, Toronto, or at the Architect's Office, 4 William St. North, Lindsay.

(Sgd.) A. R. RITTENHOUSE, Secretary,
28-29 R.R. No. 1, Pickering, Ont.

Extension of Time

Date of receiving tenders has been extended to

3 p.m. Saturday, July 21st, 1923,

Tenders for Bridges

The Hamilton and Wentworth Suburban Highways Commission

Sealed Tenders, addressed to the undersigned, will be received up to Noon on

Friday, July 27th,

for the Construction of Concrete Bridges as follows:

(1) Carlisle Bridge 24 foot span 24 foot roadway.

(2) Gage Avenue Bridge 20 ft. span 28 ft. roadway.

Plans and Specifications may be seen at the office of the undersigned. The lowest or any tender not necessarily accepted.

HUGH A. LUMSDEN JOHN E. PEART,
County Engineer. Secretary.
29 Court House, Hamilton.

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 14, Section D, subsection (b)" will be received by the undersigned until eleven a.m. standard time on

Wednesday, August 8th, 1923,

for the excavation of approximately 33.000 cubic yards of earth and other work required in the construction of Provincial highway from Springside West, 8 miles.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:—

Wm. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.; E. B. Webster, Yorkton, Sask.

An accepted cheque for the sum of $700.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of three p.m. standard time, on Wednesday, August 8th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways,
Regina, Sask.
July 18th, 1923. 29

Tenders for School

Bulk tenders for General Contract, or separate tenders for Plumbing and Heating, will be received until 5.00 P.M.

July 27th, 1923,

for the erection of a School Building at Claremont, Ontario.

Plans and specifications may be obtained from the Architects on deposit of $5.00, refundable on their return.

Tenders must be accompanied by a marked cheque or bid bond for 2½% of the tender.

The lowest or any tender not necessarily accepted.

WALKER & GIBSON,
Architects and Engineers.
29 70 Victoria St., Toronto.

Tenders for Sewers

Sealed tenders, addressed to Mr. J. H. Ruppel, Town Clerk, Elmira, will be received up to

July, 28th, 1923,

for the construction of approximately 1984 lineal feet of 8 inch sanitary sewers. The lowest or any tender not necessarily accepted.

HERBERT JOHNSTON,
Consulting Engineer,
63 Frederick St.,
29 Kitchener, Ont.

Tenders for Improvement of Road

Pursuant to the requirements of the Canada Act, sealed tenders marked "Tenders for Project 2, Section A, subsection (c)" will be received by the undersigned until eleven a.m. standard time on

Wednesday, July 25, 1923,

for the excavation of approximately 33,350 cubic yards of earth and other work required in the construction of Provincial highway from Dunkirk South, 7½ miles.

Copies of plans, profiles and specifications may be seen at the office of the undersigned, and at the office of each of the following parties:—

Wm. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.; A. E. Crosby, Sec-Treas. R.M. No. 102, Expanse, Sask.

An accepted cheque for the sum of $700.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of three p.m. standard time, on Wednesday, July 25th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways.
Department of Highways,
Regina, Sask.
July 11th, 1923. 29

TOWNSHIP OF ETOBICOKE

Area No. 6—Waterworks

Sealed tenders plainly marked as to contents will be received up to 12 o'clock noon of

Monday, July 23, 1923,

for the supply and laying of approximately 4020 feet of 6-inch and 4-inch cast iron water mains.

Plans and specifications may be seen and forms of tender obtained at the Township Offices, Islington.

The lowest or any tender not necessarily accepted.

N. MacNICOI,
Township Engineer,
29 ISLINGTON, Ont.

City of Lethbridge

Tenders for Street Paving and Sidewalks

Sealed tenders marked "Tenders for Street Paving" and "Tenders for Sidewalks" will be received by the undersigned up until noon

July 31st,

for the construction of approximately 9000 square yards of Cement Concrete Street Paving and 700 square yards of Cement Concrete Sidewalks.

Plans and specifications may be seen at the office of the commissioner of Public Works.

The lowest or any tender not necessarily accepted.

DONALD A. DUFF,
City Clerk,
29-30 Lethbridge, Alta.

Sealed tenders addressed to the undersigned and endorsed "Tender for White River Bridge" Hilliardton, Ont., will be received until 12 o'clock noon.

Tuesday, July 31st, 1923,

for the construction of the substructure, and erection of the steel superstructure supplied by the Department, F. O. B. Earlton, Ontario, of a bridge across the White River at Hilliardton, Ont.

Plans and Specifications can be seen and forms of tender obtained at the office of the Chief Engineer, Department of Public Works, Ontario, Parliament Buildings, Toronto, and of Public Works Foreman, D. H. McIntosh, New Liskeard, Ont.

Tenders will not be considered unless made on the forms supplied by the Department and in accordance with the conditions set forth therein.

Each tender must be accompanied by an accepted cheque payable to the order of the Minister of Public Works, Ontario, equal to 10% of the amount of the tender.

The Department reserves the right to reject any or all tenders received.

H. F. McNAUGHTEN,
Secretary.
Department of Public Works, Ontario.
Toronto, July 17th, 1923. 29-30

Tenders for Pavement

Sealed tenders plainly marked as to contents, will be received by Mr. John Clark, Clerk, Town of Dunnville, up to 2 o'clock P.M. on

Monday, July 30th, 1923,

for the construction of about 13,000 square yards of concrete pavement on Broad Street in the Town of Dunnville.

Plans and specifications may be seen at the office of the undersigned or at the office of their resident engineer, Mr. E. Hinchcliffe R.P.E., Union Bank Bldg., Dunnville.

The lowest or any tender will not necessarily be accepted.

FRANK BARBER AND ASSOCIATES Limited,
Town Engineers,
45 Jarvis Street,
TORONTO
Toronto, July 10th, 1923. 29

Tenders Wanted

Sealed tenders for all trades, except Heating, Plumbing and Wiring, will be received up to

Monday, July 30th,

at 12.00 noon, for the construction of College Building, stop 28 Kingston Road, for the China Mission College Corporation.

The lowest or any tender not necessarily accepted.

Deposit of ten dollars, returnable, required on plans.

Plans, specifications, etc., can be seen at office of,

J. M. COWAN, Architect,
29 991 Bay Street, Toronto.

Sealed tenders addressed to the undersigned, and endorsed "Tender for reconstruction of east pier superstructure at Cobourg, Ont," will be received at this office until 12 o'clock noon, (daylight saving),

Thursday Aug. 2nd, 1923,

for the reconstruction of 170 lineal feet of the superstructure of the east pier at Cobourg, Northumberland County, Ont.

Plans and forms of contract can be seen and specification and forms of tender obtained at this Department, at the offices of the District Engineers, Equity Building, Toronto, Ont.; Royal Bank Buiding, London, Ont., and at the Post Office, Cobourg, Ont.

Tenders will not be considered unless made on printed forms supplied by the Department and in accordance with conditions contained therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p.c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

Note—Blue prints can be obtained at this Department by depositing an accepted bank cheque for the sum of $20.00, payable to the order of the Minister of Public Works, which will be returned if the intending bidder submit a regular bid.

By order
R. C. DESROCHERS,
Secretary.
Department of Public Works.
Ottawa, July 10, 1923. 29-30

Wanted on Brockville, Separate School

Steel Fire Escape, Three Story Building.

Apply B. F. LEEDER, Sec. Treas.
29 76 Church St., Brockville, Ont.

Concrete Pavement

[illegible] Dr. H. E. Heath, [illegible] marked "Tenders [illegible] Pavement," will be received by registered mail up till 6 p.m.

July 27th, 1923,

for the construction of approximately 9,000 square yards of Concrete Pavement. Plans and specifications may be seen at the office of the [illegible] or at the office of [illegible] Dundas Street, Oakville. The [illegible] necessarily accepted.

ROY L. SMITH,
Civil Engineer,
Oakville.

To Architects

[illegible] commission as associate R.I.B.A., will be held in Toronto in December 1923. Those intending to sit for this examination should forward their applications to England [illegible] August 31st, 1923, upon forms which may be obtained from

F. S. BAKER,
Hon. Secretary R.I.B.A. for Canada,
29-30 67 Yonge St., Toronto.

CONTRACTORS SUPERINTENDENT requires position; well up in reinforced concrete and all classes of construction, life long experience, excellent references, quantities and estimating, apply Box 305, Contract Record, Toronto. 27-29

CIVIL ENGINEER with contracting and executive experience and the very best of references would like to make connection with a going contracting firm or hear from somebody who needs the services of such a man. Am in a position to invest some money in a sound proposition. Box 303, Contract Record, Toronto. 27-29

For Sale

5,000 lin. feet of 2" pipe, 5,000 lin. feet of 1½" pipe in good condition, used only two months.
1 Sawyer Massey Road Grader.
1—50 ton bin and screen, with elevator and buckets.
1,000—lin. feet Blaw-Knox 6" road forms.
1—C. H. & E. Water Pump.
1 [illegible]
1—Buffalo-Pit Road Roller.
Box 291, Contract Record, Toronto. 25-29

For Sale

Fireproof vault doors in good condition, apply Box 304, Contract Record, Toronto. 28-31

Wanted

3—1½ yard Dump Wagons. Apply Box 314, Contract Record, Toronto. 28-29

Wanted

Experienced general foreman for concrete bridge work, outside city. Apply Box 313, Contact Record, Toronto. 28-29

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Camp Outfit Wanted

Contractor wants used camp outfit consisting of Tents, Blankets, Stoves, etc. Write Box 315, Contract Record, Toronto. 28-29

For Sale—Cheap

1—6 ft. Wettlaufer Mixer on trucks with side loader and gasoline engine. Overhauled and painted and in good running condition. K. W. Lewis, 105 Front St. East, Toronto, Ont. 28 T.f.

Contractor with grading and highway equipment for 25 teams open for sub contract for balance of season anywhere in Ontario. Write for particulars to Box 319, Contract Record, Toronto. 29-30

Residences

(Continued from page 51)

Toronto, Ont.

Mr. D. S. Fraser, 8 Glenlake Ave., is receiving tenders for the electric work, plumbing, heating, plastering and painting of a $6,500 residence he is building on Jane St.

H. W. McIntosh, 114 Woodsides Ave., has commenced the construction of a residence on the west side of Palisades Ave., to cost $9,500 and will let subtrades including electric work, plumbing, heating, plastering and painting.

Tenders are being received by H. Harley, 2 Batavia Ave., for the electric work, plumbing, heating, plastering and painting of a $6,500 residence he is building on Watson Ave.

W. McQueen, 12 Raymond Ave., is building a residence costing $7,500 on the west side of Raymond Ave., and will let the following sub-trades: electric work, plumbing, heating, plastering and paintin.

T. Vose, 98 Atlas Ave., will let the electric work, painting, plastering, plumbing and heating contracts in connection with a bungalow he is building on Atlas Ave., costing $6,500.

Dr. T. L. Granovsky, 287 Spadina Ave., wants tenders on plumbing, heating, plastering and painting for $10,000 residence he is having built on Heath St.

B. Cole, 20 Britannia Ave., will let tenders for the electric work, plumbing, heating, plastering and painting in connection with $6,500 residence he is building on Thornhill Ave.

D. W. Nasmith, 782 St. Clair Ave. E., will let painting, electric, plastering, plumbing and heating trades for $8,000 residence he is building at 140 Lytton Blvd.

The electric work, heating, plumbing, plastering and painting in connection with $6,500 residence being built on Windermere Ave., by J. W. Sanders, 253 Armadale Ave., will be let by the owner.

D. E. Munroe, 65 Lauton Blvd. will have plans prepared for a $40,000 residence to be built by himself at the corner of Dunvegan and Russell Hill Roads. J. Hunt Stanford & Son, 67 Yonge St. Arcade, Toronto, are mentioned as the probable architects.

Mechanical trades to be let in connection with $8,000 residence being built at 303 Rose Park Drive, for E. A. Simpson, Admiral Rd. Architect, E. J. Gibson, Excelsior Life Bldg.

Tenders are being received by John E. Carlisle, 181 Dunvegan Rd., for subtrades in connection with a $9,000 residence he is building on the south side of St. Edmunds Drive.

CONTRACTS AWARDED

Burlington, Ont.

Hugh Whitham, 280 John St. S., Hamilton, has the contract for plumbing and J. A. Dynes, Prospect St., Hamilton, the contract for electric work in connection with $15,000 residence being built on the Toronto-Hamilton highway near Burlington, for Mr. Luther Holton, 312 Bay St. S. Hamilton. W. H. Craddock, 217 Queen St. S., Hamilton, is the general contractor.

The electric contract for $15,000 residence being completed on the Toronto-Hamilton highway, near Burlington, for Kent Hamilton, 407 Queen St. S., Hamilton, has been let to Hunter & Strome, 128 Queen St. S., Hamilton. Architect, Stewart McPhie, Bank of Hamilton Bldg., Hamilton.

Dutton, Ont.

The general contract for an $8,000 residence to be built here by Thos. Hockin, has been let to A. Morris, 54 East St., St. Thomas. It will be one and a half storeys, 25 x 30.

Fredericton, N. B.

The contract for building $6,000 residence on Charlotte St., for Frank Vanwart, 374 George St., has been let to F. E. Wood, 171 Saunders St. Architect, Wm. Minue, 220 Aberdeen St. Subtrades will be let.

Halifax, N. S.

The plumbing and heating contract in connection with $8,000 residence being built on Cambridge St., for H. S. Mussett, 138 Henry St., has been let to Roy McKay, 145 North St. G. W. Embree, 103 Lawrence St., is the general contractor.

Hamilton, Ont.

The following sub-trades have been let in connection with $10,000 residence being built on Chestnut Ave., for the Standard Home Building Co., Gibson & Cannon Sts.: electric, Geo. Evoy, Bartonville, Ont.; plumbing, Jas. Saynor, 427 Aberdeen Ave.; plastering, Tom Squires, 253 St. Clair Ave.; painting, A. Abraham, 89 Sherman N.; heating, C. Emery, 54 Cheever St. The general contractor is J. Bryers, 220 Kingston St. N.

London, Ont.

A. E. Payne, 178 Simcoe St., has the general contract for residence costing $7,000, on Windsor Ave., for J. A. Jones, 439 Maitland St. Prices wanted on all materials.

General contract for the erection of $10,000 residence on Victoria St., for E. Underhill, 106 Askin St., has been let to J. H. Plested, 108 Holton St. Prices are wanted on materials.

The contract for building a residence at 37 Belgrave Ave., for Mr. Bert Summers, 693 King St., has been let to H.

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FEDERAL MOTOR TRUCK CO.
Detroit, Michigan

[illegible] Walsh, [illegible] Duchess St., at $7,000 [illegible] being done by day labor.

Montreal, P. Q.

The following sub-trades have been let in connection with $110,000 apartment building being erected at Kesington & Sherbrooke Sts., for X. B. Deseve, 334 St. Joseph Blvd.: masonry, Jos. Cassiami, 126 Regent St.; roofing, plumbing, heating and plastering, J. Blanchard & Son, 2132 St. Lawrence; electric, W. Staines, 587 Cadieux St. Architect, Bigonesse & Bigonesse, 182 St. Catherine St. E.

The following sub-trades have been let in connection with twelve flats, costing $35,000, being built on Fabre St., by R. Messeir, 633 Fabre St.: roofing, plumbing and heating, A. LeFrancois, 444a Chamboro; electric, R. Chamberland, 16 Gagnier St.; plastering D. Menard, 62 Gagnier St. Painting is being done by day labor.

Mr. J. Monette, 32 St. Louis Sq., has the contract for masonry work in connection with residence and tenements being built on the corner of Roy, St. Andre and St. Christophe Sts., for Leon Gelinas, 1040 St. Hubert St. General contractor is T. P. Belair, 30 Mentana St.

Mr. I. Vantrim, Apt. 2, 1040 St. Hubert St., has let the painting contract in connection with $25,000 residence he is building on St. Denis St., to J. A. Francoeur, 538 Fabre St., and the plastering contract to D. Perron, 33 Chambly St.

Mr. H. E. Mayer, 516 Lafontaine Park, has the roofing contract for 3 residences [illegible] Marlow St., being built by Manseau & Bealieu, 375 Westhill St., valued at $30,000, and Mr. Desjardins, Terrebonne, P.Q., has the millwork contract. The electric, plumbing, heating, plastering, brickwork, m[illegible] and tile contracts will be let.

The following contracts have been let in connection with 6 pair of semi-detached residences being built at a cost of $60,000, on Beaconsfield Ave., by Owen Roberts, 340 Hingston Ave.: roofing, D. Nicholson & Co., 837 St. Paul St. W.; electric, Booth Bros., 5727 Sherbrooke St. W.; plumbing and heating, day labor, materials supplied by Jas. Robertson, 142 William St.; plastering, A. Leger, 236 Maple Ave., Ville St. Pierre; painting, Jos. Cyr & Co., 75 Troy Ave.

The following sub-trades have been let in connection with residence being built on 9th Ave., by M. Roussel, 1410 6th Ave.; masonry, G. Therrien, 2123 Orleans St.; carpentry, J. Champagne, 418—5th Ave.; plumbing, A. Belair, 2134 Orleans St.

The Canadian Benedict Stone, Ltd., Haig Ave., Longue Pointe, are supplying stone for the $250,000 housing development on Simpson St., for the Prudential Development, and dumb waiters are being supplied by Darling Bros. Ltd., 120 Prince St. The development includes 17 residences. Walls are going up at the present time.

The following sub-trades have been let in connection with two residences costing $22,000 and being built on Berri St., by G. H. Robert, 2409 Christophe Colomb St.: roofing and plumbing, H. Corbeil, 2286 Berri St.; electrical work, E. Pilon, 685 Papineau; plastering, N. Lapierre, 618 Fabre St.

C. Barbeau, 1605 De L'Eglise Ave., has been awarded the general contract for the construction of 3 residences on St. Antoine St., for G. Viau, 1137 St. Antoine St., to cost $14,000. Roofing, electric, plumbing, painting, millwork, and brickwork to be let.

Niagara Falls, Ont.

H. W. Pinneo Manufacturing Co., Oak St., have awarded the contract for the concrete blocks in connection with 4 residences they are building on Glenholme Ave., valued at $3,100 each, to P. Gardner, 50 Queen St.

Ottawa, Ont.

The following sub-trades have been let on $7,000 residence being built by E. Morris on Coburg St.; electric, Jos. Ladouceur, LeBreton St.; plumbing, Mr. Newlands, c/o the G. C.; heating, Capital Hardware Co., Bank St.; plastering and painting, day labor. The address of the owner is c/o the general contractors, Holbrook & MacDonald, 102 Caroline Ave.

The electric contract on $50,000 apartment building at Besserer & Chapel Sts., for McCarthy, Wakeley & Wakeley, Westboro, has been let to the Marchand Electric Co., Banque Nationale Bldg., and the plastering, to Chas. Hunt, Arlington Ave. Painting is being done by day labor.

Contract for the plumbing and heating of $35,000 residence being built on Range Rd., for J. R. Booth, Jr., Roxborough Apartments, has been let to McKinley & Northwood, 52 Rideau St. The architects are Burritt & Kingston, Hope Chambers, and the general contractors, Holbrook & Son, Hope Bldg.

Outremont, P. Q.

The following sub-trades have been let for residence and store building, costing $10,000, under erection on Belanger St., for E. Brazeau, 2077 Boyer St.; electric work, Mr. Talbot, Boyer St.; masonry, Mr. Delongchamps, 2227 Boyer St.; plumbing, D. Homier, 2063 Denormanville St. The plastering and painting trades will be let.

Port Colborne, Ont.

The following sub-trades have been let in connection with $6,000 residence being built by Arthur Mathewson, Ridgeway, Ont., for A. D. Cross, on Clarence St., Port Colborne: electric, Chester Bearss, Ridgeway; plastering, Peter Beam, Port Colborne, and painting, James MacDonell, Humberstone, Ont.

St. Catharines, Ont.

Messrs. Newman Bros., 75 St. Paul St., have the masonry contract for residence at Park Place, being built by H. H. Wilson, 7 Raymond St. The owner will let all sub-trades.

Toronto, Ont.

The following sub-trades have been let in connection with 8 residences on Ralph Ave., for G. F. Cudmore, 80 Indian Grove: electric, R. E. Holditch, 2252 Bloor W.; plumbing, Alex. Shanks, 1 Edith Ave.; heating Sutherland & Co., 52 Evans St.

D. C. Kay, 258 Ashdale Ave., has the contract for the erection of 4 detached residences costing $9,500 each, on Servington Cres. Mr. Harold K. Watson, Excelsior Life Bldg., is the architect.

Steel for a 6-suite apartment house and cafeteria, being built on Bloor St. W., for Dr. Wm. J. McCormick, 16 Gothic Ave., will be supplied by Hepburne & Disher Co. Ltd., 18 Van Horne St. Louis Bell, 34 Clinton St. has the contract for the drains and concrete. The general contractors, McIlroy & Lowry, 286 Kennedy Ave., will receive tenders

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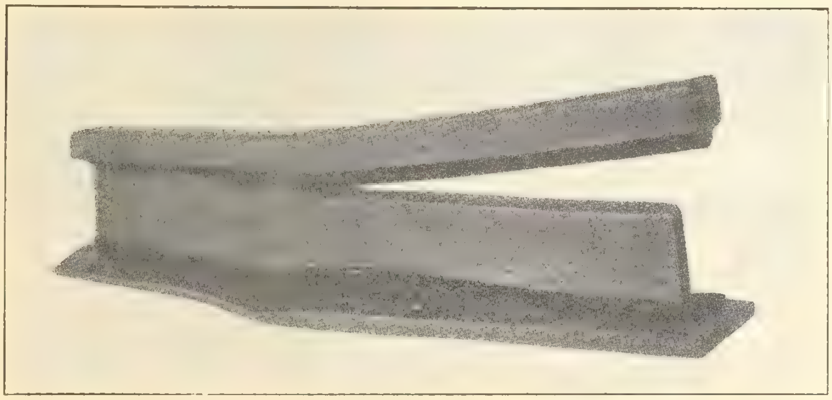
"Close-up" of a rail part of which has passed through the slitting mill. Showing how the rail is slit into three separate parts—the head, web and flange.



The Re-rolled Argument

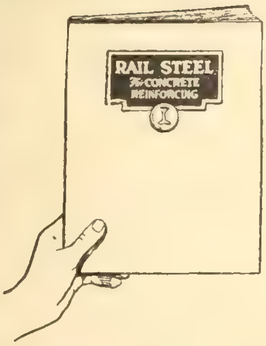
Rail Steel Reinforcing Bars are sometimes referred to as being "re-rolled." This term applied to Rail Steel is a misnomer.

In rolling Rail Steel Bars, the rail is separated into three parts, the head, web and flange; and these parts are treated individually as billets and rolled into bars, or other sections. The Rail Steel Bar is the result of a continuation of the rolling process, and is in no sense a "re-rolled" product.

The objection to the term "re-rolled" is that it permits confusion of Rail Steel Bars with bars re-rolled from various kinds of scrap, shell discard, etc.

It is important to note that the A.S.T.M. Specification A-16-14 covers "Rail Steel Concrete Reinforcement Bars," and no mention is made of "re-rolled" bars. Furthermore, under "Process" this specification stipulates that the "bars shall be rolled from standard section Tee Rails."

Rail Steel Bars are not "re-rolled" bars, and if you specify bars to meet A.S.T.M. Specification A-16-14, no undesirable re-rolled material can be substituted.



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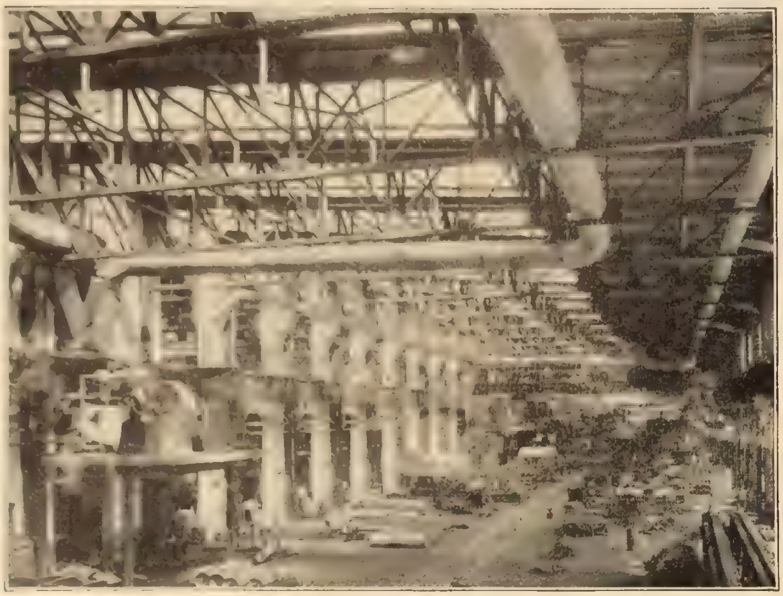

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on the electric painting, plumbing and heating trades.

D. C. Kay, 258 Ashdale Ave., has the general contract for a $42,000 apartment house being built on the west side of Spadina Rd., near Coulson Ave. Harold K. Watson, Excelsior Life Bldg., is the architect. The building will be 3 storeys and basement, 63 x 43.

The following sub-trades have been let in connection with $20,000 duplex residence being built on Glen Rd. for W. G. Noble: Tinsmithing and roofing, Lawson & Stewart, 424 Balliol St.; plumbing and heating, W. H. Booth, 365 Dovercourt Rd.; electric, Moss & Stocks, 1145 Yonge St.; plastering, John Boyce & Son, 21 Rolyat Ave.; painting and glazing, Thos. Lunn, 74 Spruce Hill Rd. The owner's address is c/o the architect W. B. Galbraith, Excelsior Life Bldg.

The plastering contract in connection with large residence being erected on Mossom Rd., for Mr. G. W. Lunney, has been let to Watkin Bros., Lambton Mills, and the painting contract to F. W. Steane, 239 Concord Ave. The architect is Mr. Murray Brown, Confederation Life Bldg.

Following sub-trades have been let in connection with residence and garage costing $10,500, being built on Ralph Ave. by Mr. G. K. Wark, 280 Pacific Ave.: carpentry, J. P. Wright, Baby Pt. Cres.; plumbing, J. R. Seger, 288 Jane St.; hot air heating, Christie Bros., 3046 Dundas St. W. The electric, plastering and painting trades have not been let.

The following sub-trades have been let in connection with 14-suite apartment house on the south side of Bloor St., at Christie: roofing, Terry Bros., 254 St. Helens Ave.; plumbing, H. Dennison, 126 Essex Ave.; heating, W. Schulking, 932 College St.; electric, Wood Electric Co., 153 Victoria St.; plastering, Strauss & Levine, 137 Bellwoods Ave.; painting and decorating, Geo. Latimer, 192 Delaware Ave. Architect, Neil G. Beggs, 6 Jean St.

The following sub-trades have been let in connection with two residences being built on Parkview Gardens, for McIlroy & Lowry, 286 Kennedy Ave.: plumbing, H. Duffin, 29 Jamieson Ave.; electric, P. J. Dunn, 243 Fairview Ave.; heating, Geo. E. Wilks, 792 Ossington Ave.

Geo. H. McLaughlin, 48 Hogarth Ave., has the general contract for the erection of a $7,000 residence at 56 Melrose Ave., for J. H. O'Connor, 623a College St.

D. C. Kay, 258 Ashdale Ave., has the general contract for a $20,000 residence being built on Austin Terrace. Mr. Harold K. Watson, Excelsior Life Bldg., is the architect.

D. C. Kay, 258 Ashdale Ave., has the general contract for a $16,000 residence at the corner of Austin Terrace & Austin Cres. Architect, Harold K. Watson, Excelsior Life Bldg., Toronto.

D. C. Kay, 258 Ashdale Ave., has the general contract for $18,000 residence on Glencairn Ave. W. Harold K Watson, Excelsior Life Bldg., is the architect.

The contract for the electrical work in connection with new $15,000 residence just being completed in Moore Park, has been let to the Patterson Electric Co., 615 Yonge St. Architects, Belfry & Wilson, 2 Bloor St. W.

J. E. Harman, 42 Arundel Ave., has

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6 Feb. 1922
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Arch. Wm. E. Minue, 220 Aberdeen St., Fredericton
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the electric contract for 4 residences being built on Dunvegan Rd. by O. E. Munroe, 65 Lawton Blvd., valued at $9,000 each. Plastering and painting will be let by owner.

Verdun, P. Q.

The Ross Realty Co. Ltd., 17 St. John St., are building 6 residences, costing $25,000, on Beatty Ave. All work is being done by day labor.

Victoria, B. C.

Messrs. Hunter & Hackett, Blanchard St., Victoria have the general contract for the erection of an $11,000 residence for Mrs. Bates, on Pemberton Road. Architect, Sam Maclure, 404 Union Bank Bldg., Victoria. Owner's address c/o architect.

Westmount, P. Q.

L. Savaria, 1765 Chateaubriand, has the general contract for large residence, 75 x 35, and garage on the corner of Claremont & Willow, for R. Ouimet, 182 Mansfield St. Roofing, electric work, plumbing, heating, plastering, painting and tiling will be let by the general contractor.

D. Nicholson, 657 St. Paul St. has the roofing contract and Booth Bros., 5727 Sherbrooke W., the electric contract in connection with 2 pairs of semi-detached residences being built on Belgium St., by Hand & Parker, 4857 Sherbrooke St., at a cost of $70,000.

Reid Bros., 2a Tower, have the general contract or the erection of a $25,000 residence at the corner of Trafalgar and Mount Pleasant, for J. M. Morris, c/o Fox & Morris, Board of Trade Bldg. The roofing, electric, plumbing, heating, plastering, painting, millwork, marble and tile contracts will be let.

Power Plants Electricity and Telephones

CONTRACTS AWARDED

Campbellford, Ont.

The Sinclair Construction Co., Campbellford, Ont., is mentioned as the probable contractor for the $250,000 power development at dam No. 8, Trent River, for the Hydro Electric Power Commission of Ontario, University Ave., Toronto. The development will include the construction of power house, foundation and tailrace.

Cooksville, Ont.

The town council in conjunction with the Ontario Hydro Commission, is considering the installation of an electric lighting system for the town.

Hennings Fall, P. Q.

The Southern Canada Power Company, 20 St. Nicholas St., Montreal, are contemplating a power development here and will probably call tenders in September.

Miscellaneous

Eastern Harbour, N. S.

Tenders are being received by the Dom. Dep't. of Public Works, through the secretary, R. C. Desrochers, Parliament Buildings, Ottawa, until noon July 30, for dredging here. Plans and specifications at the department, Ottawa, and at the office of the district engineer, Bellevue Bldg., Halifax, N. S.

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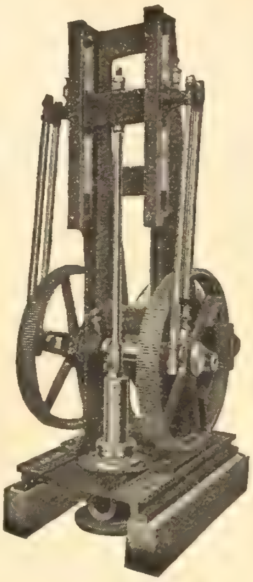

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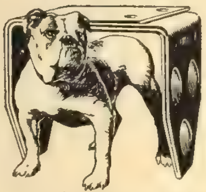

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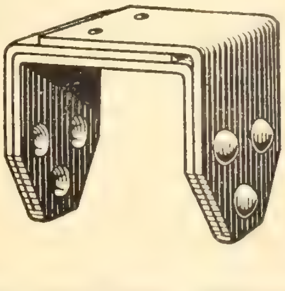

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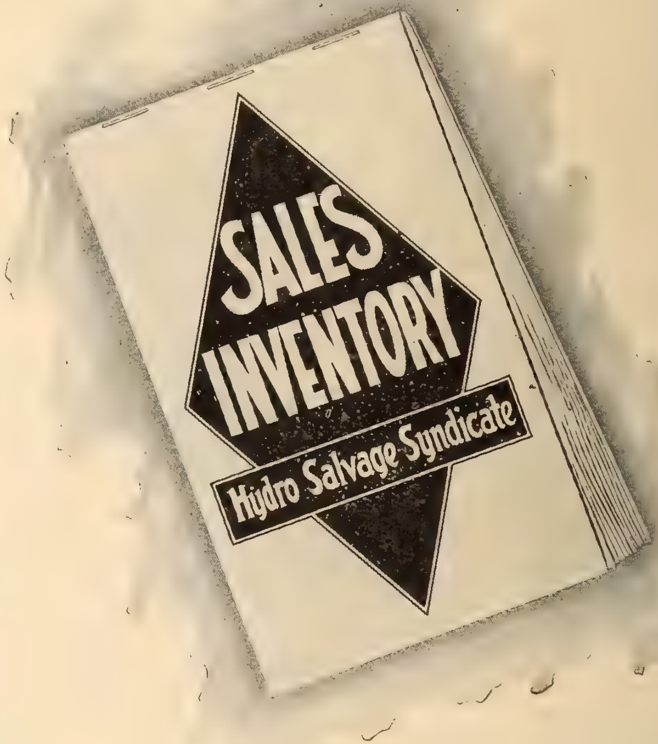

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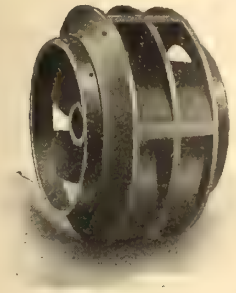
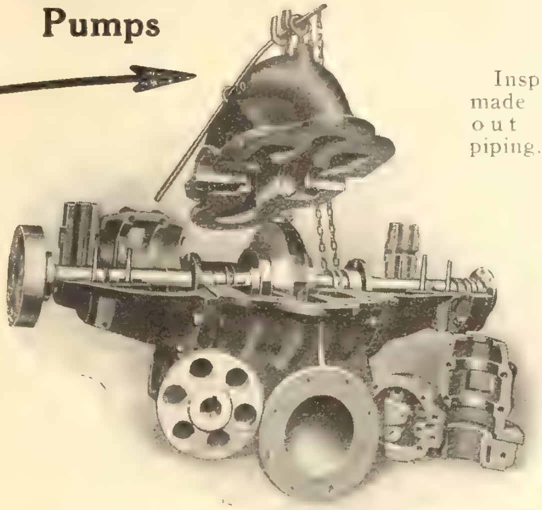


Double Suction impellers help assure hydraulic balance.



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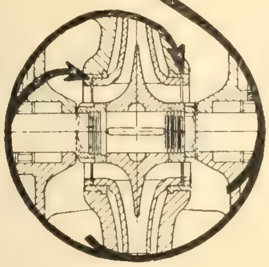

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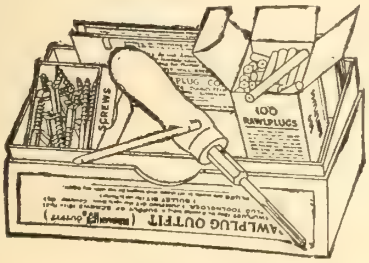

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		Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.45
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	10.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	25.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*†	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	25.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M	21.00	19.00		40.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00**	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base	4.00 base	4.60	[illegible].00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.00 "	5.10 base	
Hoops	per 100 lbs.	5.00 "	3.75 "		
Twisted and deformed bars	per 100 lbs.	3.90 "	4.00 "	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	4.00 "	4.00 "	5.35	6.00
Structural shapes	per 100 lbs.	3.90 "	4.25 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.15	6.25
Plates—3/16 in.	per 100 lbs.	4.40 "	4.25 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.50 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.50 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
Cast iron pipe	per ton	65.00 "	60.00 "		
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Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.45	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
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Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	45.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	135.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	145.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.25	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	70.00

PAINTS, OILS, COLOURS (delivered):—		Toronto	Montreal	Winnipeg	Vancouver
White lead ground in oil, less than ton lots	per cwt.	15.00	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	14.50
Putty in bulk	per cwt.	5.95	4.25	5.50	6.50
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.38	1.40	1.26	1.56
Raw linseed oil, in bbls.	per gal.	1.35	1.38	1.23	1.53
Turpentine, in bbls.	per gal.	1.60	2.20	2.50	2.80
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45

PLASTER (Delivered):—		Toronto	Montreal	Winnipeg	Vancouver
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	26.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50

LABOR:—		Toronto	Montreal	Winnipeg	Vancouver
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.25	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers (Common)	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Laborers (Skilled)	per hr.	.60-.70			.90
Sheet Metal Workers	per hr.	.80			

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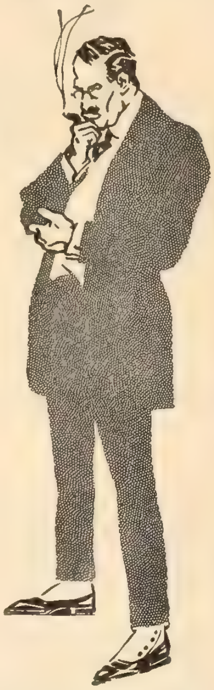

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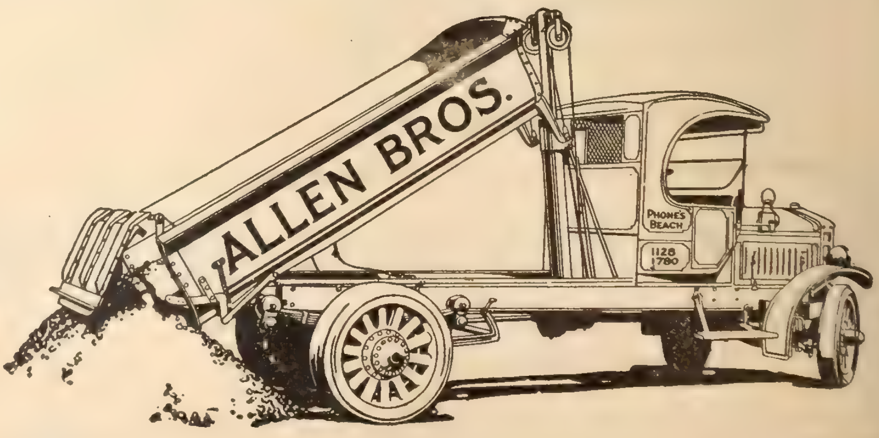

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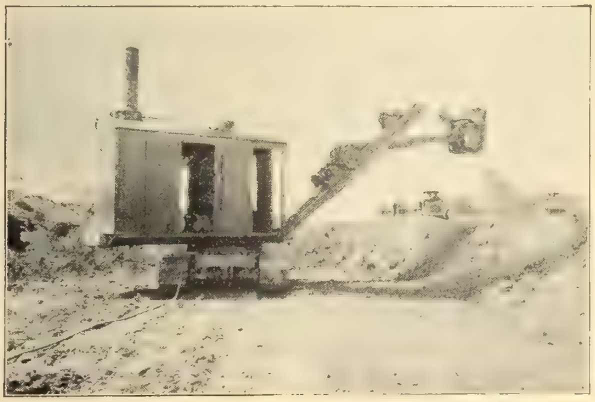

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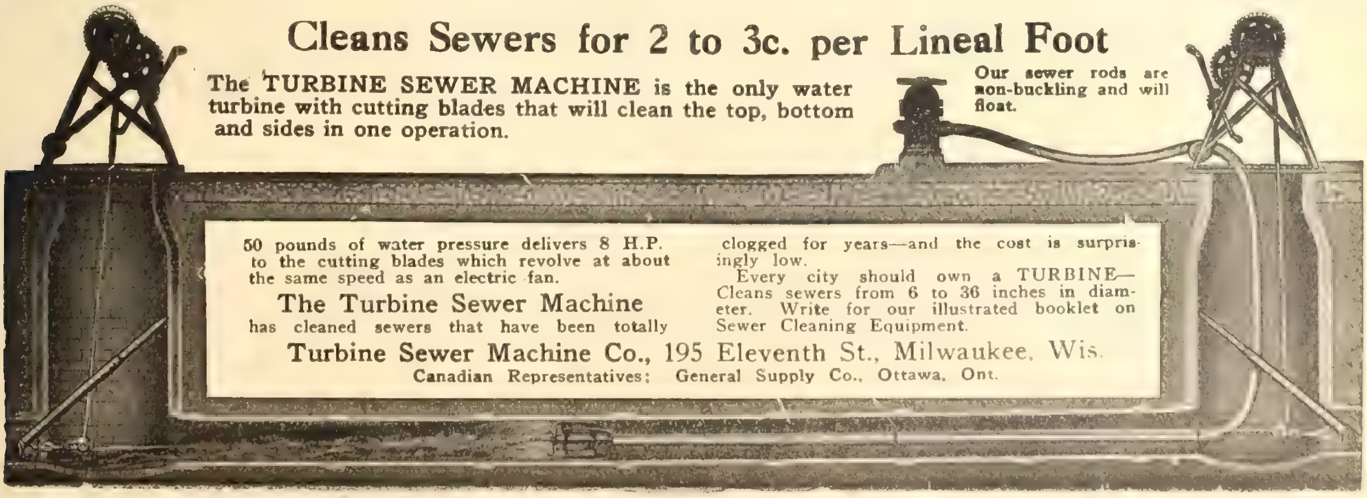

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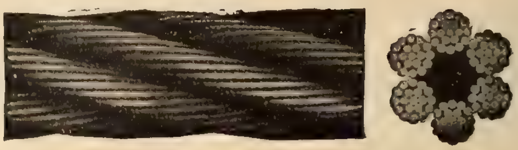

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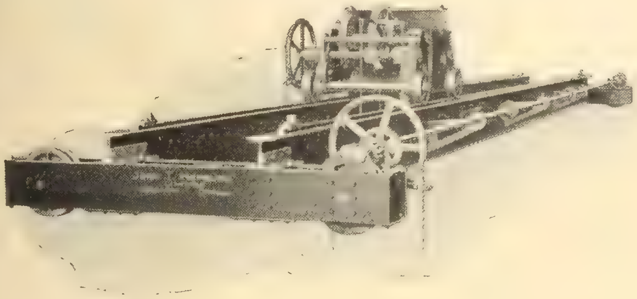

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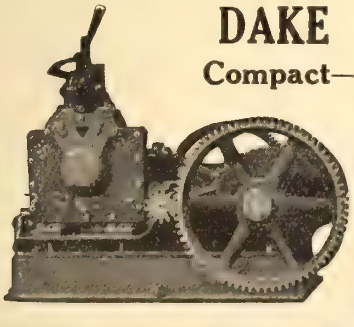

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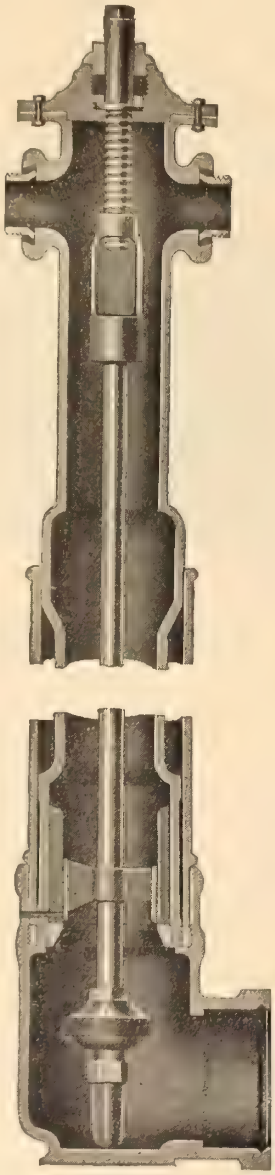

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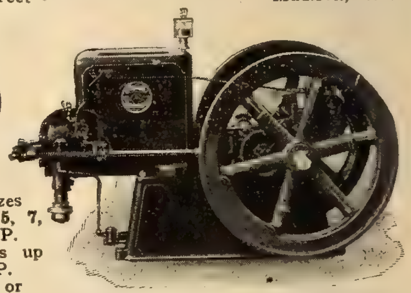

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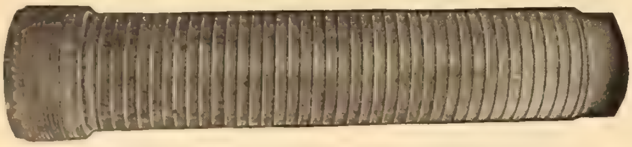

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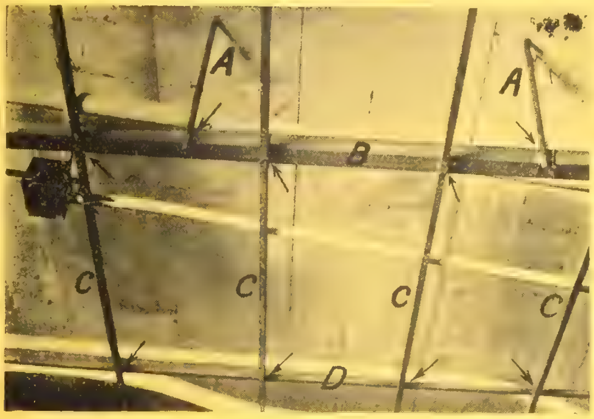

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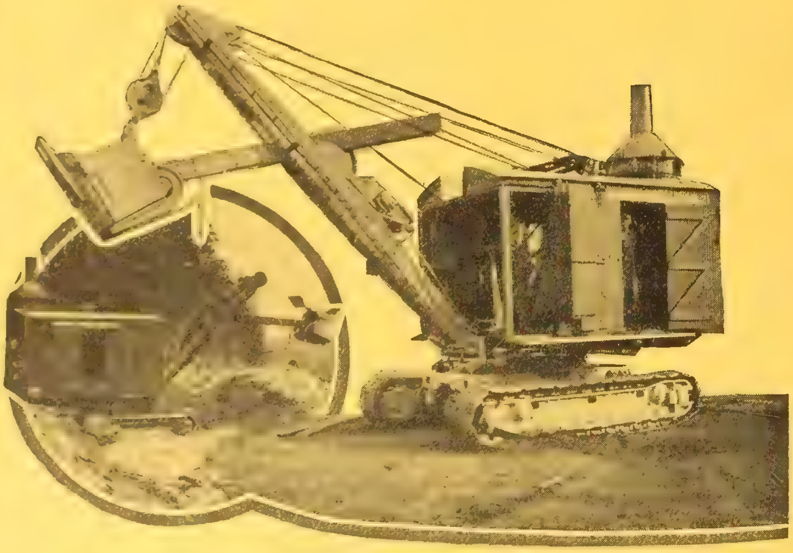

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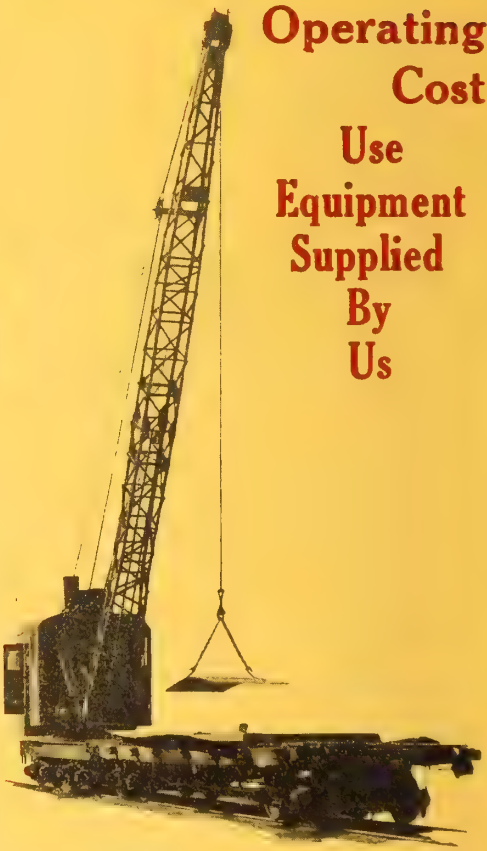

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"INDUSTRIAL" PILE DRIVERS
AND CRANES
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Limited

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Vol. 37 Toronto, July 25, 1923 No 30

Contract Record and Engineering Review

River Road between St. Lambert and Montreal South, P.Q.

Built by Peter Lyall & Sons and W. I. Bishop Const. Co. Inspection work by Milton Hersey Company.

Over Old Macadam

An old macadam road makes a splendid foundation for an asphalt pavement. Compacted by traffic over a number of years, it has the necessary strength to support quite heavy loads and only needs a smooth waterproof, resilient surface of Imperial Asphalt to fit it for modern traffic requirements. The economy of thus utilizing an old road, combined with the accepted advantages of Asphalt, is well worth considering in any road improvement programme.

ROAD ENGINEERING DEPARTMENT

Toronto **Imperial Oil Limited** Canada

IMPERIAL
Asphalt
PRODUCTS

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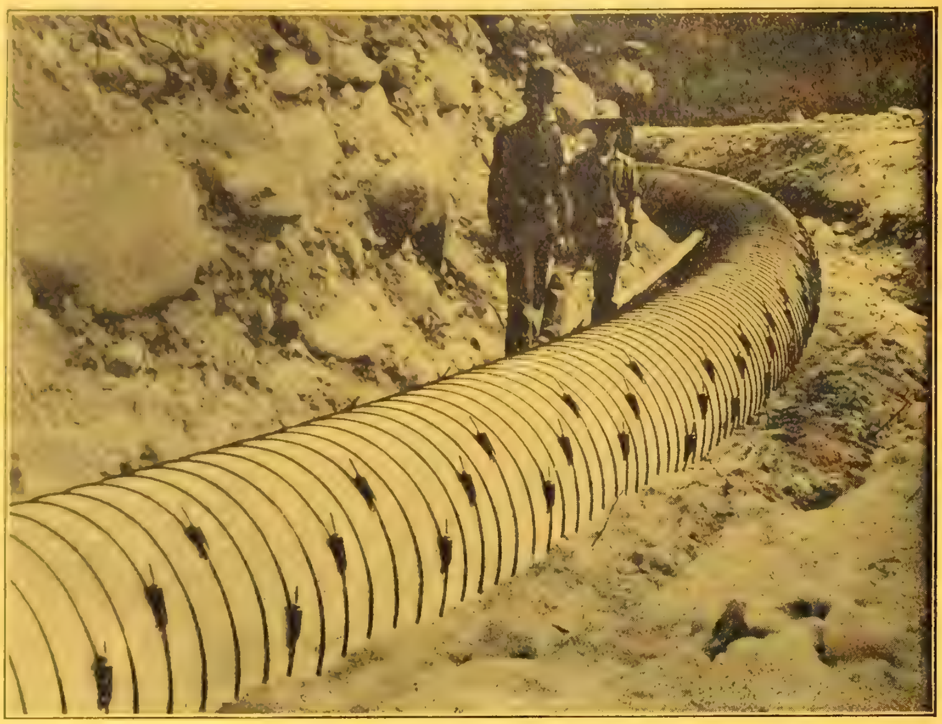

A view of our 36″ Continuous Stave

Wood Pipe

in the famous Capilano Pipe Line which, after serving Vancouver City faithfully for over 15 years, is still in its infancy.

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is used successfully for hydro-electric purposes up to 14 ft. in diameter.

TANKS
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Any Size—Any Style

CONTINUOUS STAVE
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or WIRE WOUND

YOU CAN NO LONGER RECKON WITHOUT WOOD PIPE

We have enthusiastic customers willing to assure you that recent improvements have so increased efficiency and durability as to place **Wood Pipe** on a plane with Cast Iron. These features at a low initial cost, combined with ease of transportation and installation, spell true **Economy.**

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STEEL
DOUBLE COUPLING
with Inside Ring
Galvanized

has entirely eliminated joint leaks and has perfected
WIRE WOUND PIPE

Canadian Pipe Company, Ltd.

550 Pacific St., VANCOUVER, B. C.

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The Acid Test

The Chemist knows what materials are destroyed by acids and what are not affected. He also knows that many chemical wastes are discharged into the public sewers.

Because most sewers are constructed of vitrified materials similar to the vessels in which the chemist keeps his chemicals no harm results.

If new materials are advocated for sewer construction their resistance to chemical action should be tested. The chemist can perform such tests with the greatest accuracy and with many agents.

Simple preliminary tests can, however, be made to determine the resistance to the most common chemical wastes.

Sulphuric acid is most universally used in chemical and mechanical industries. In the United States the consumption amounts to over seven million tons per annum. Witnesses before the Royal Commission on Sewage Disposal testified that manufacturers sometimes discharged into sewers one hundred gallons at a time. When discharged into the sewers it is greatly diluted, but is nevertheless very destructive to certain materials.

To test the resistance to acids, of any material to be used for sewer construction, dilute ordinary commercial sulphuric acid with water to make a One per cent. solution. Immerse the material in such a solution and allow it to remain for a few days and note the result. Vitrified Clay Pipe will not be affected. Some substitutes will show that their resistance to chemical action is very weak and that they are not suitable for carrying industrial wastes.

Alkalis are often as destructive as acids, and the disintegration of concrete by alkaline ground waters is a serious problem. Vitrified Clay Pipe is unaffected by acid or alkali. It is the most permanent and resistant material for sewer construction and universally used by the greatest manufacturing cities all over the world.

No substitute will give longer service or greater efficiency than Vitrified Clay Pipe.

Vitrified Clay Pipe Publicity Bureau

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These Indicator Posts function satisfactorily and will stand the strain of severe usage so detrimental to inferior equipment.

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Jenkins Indicator Posts and the complete line of Jenkins Diamond marked Valves are pictured and described in Catalog No. 9—free on request.

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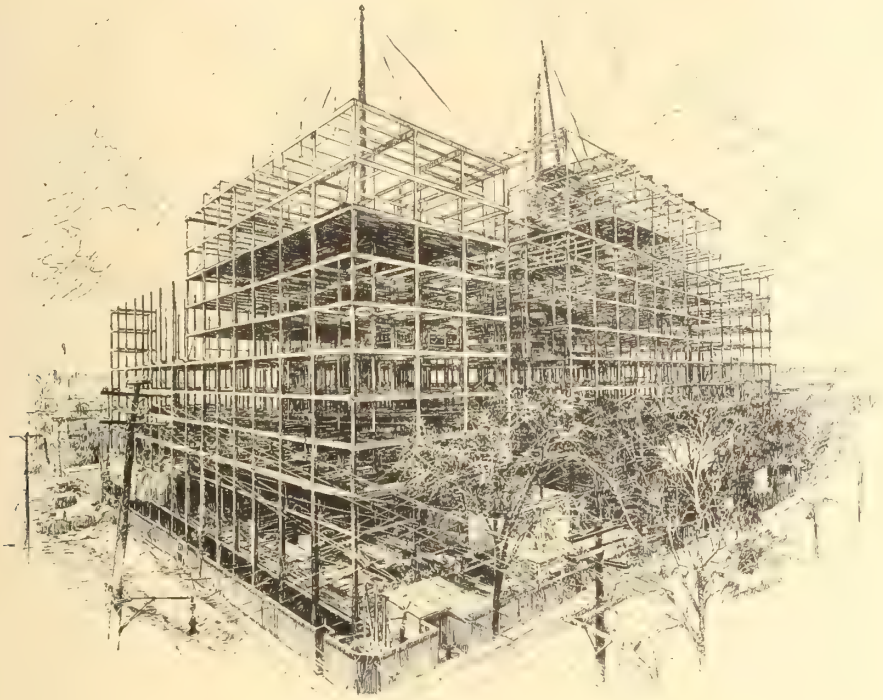
as Winter always does



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is particularly well adapted for construction work, in avoiding the usual interrupted progress of erection when the time schedule runs into the Winter Months.

Winter construction with STRUCTURAL STEEL is profitable, from the economy, due to the increased supply and efficiency of labor during the cold weather months.

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STRUCTURAL STEEL

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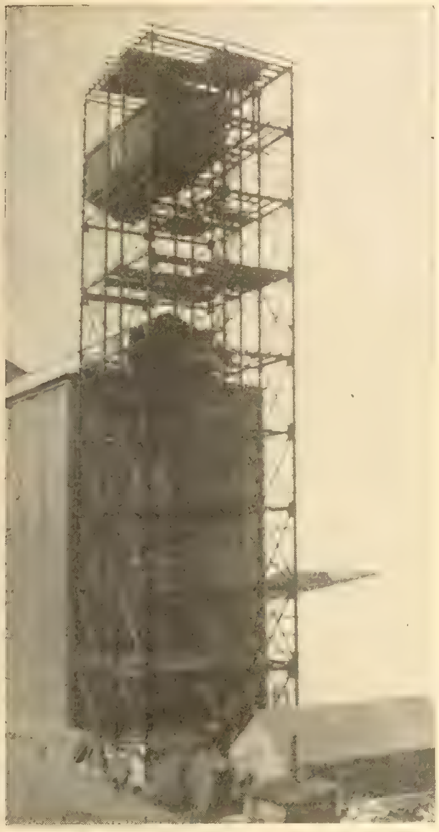

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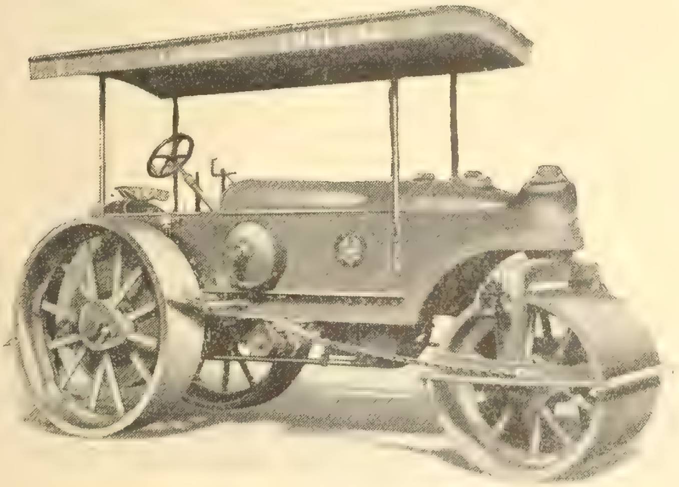

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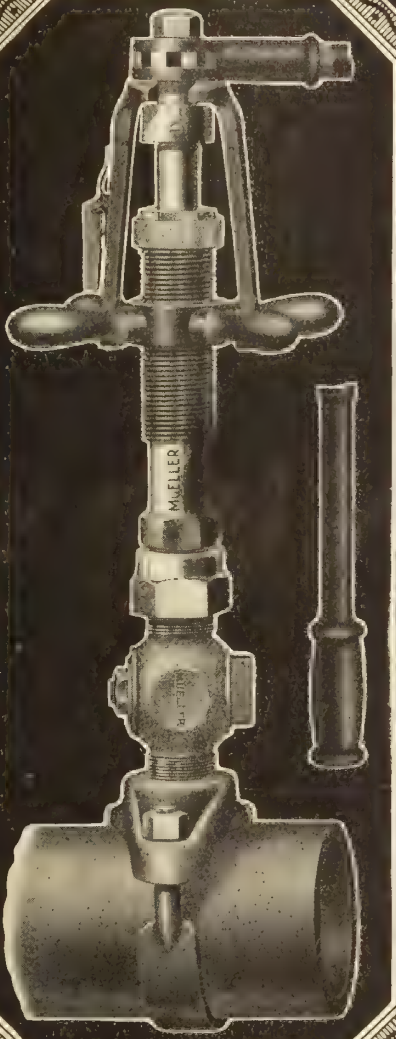

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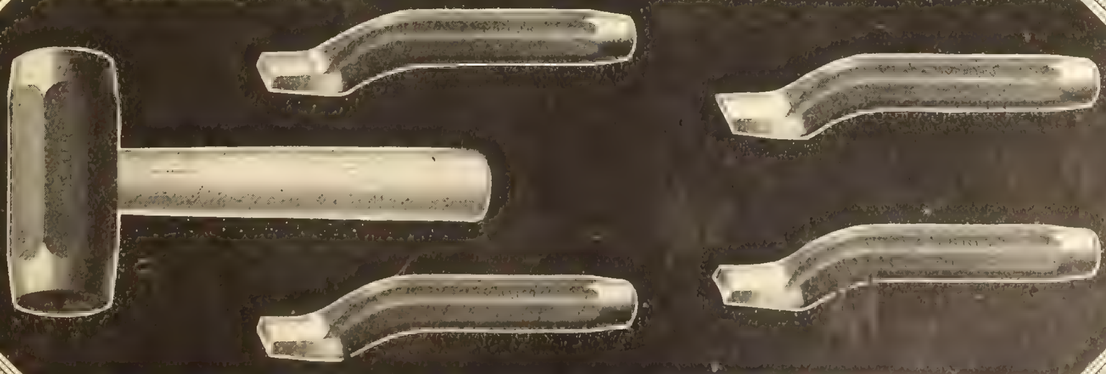

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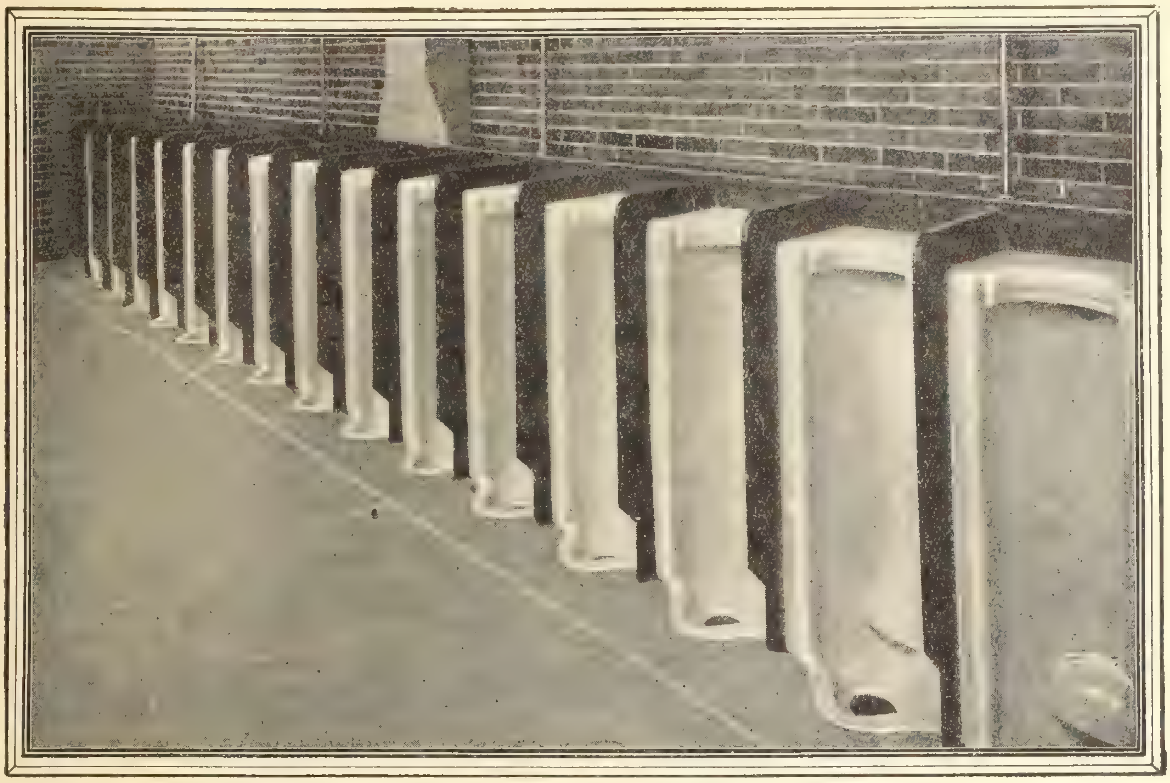

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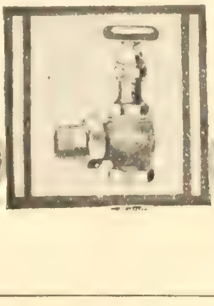

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Specified and
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The Fire Barrier

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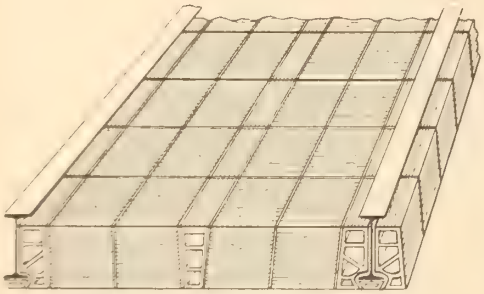

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The shovel stepped right along, its treads clinging to the slippery, yielding bottom. The Thew Power Steer made it easy for the operator to handle it without leaving the cab and no one had to get down in the water to hook up any special mechanism.

Because it out-digs the ordinary shovel on any job and meets just such emergencies as this without fuss or worry, the Thew fully justifies the confidence that owners and operators have in it.

After all these men are the best witnesses. Read what some of them have to say in Folder 523, out this month. Write for your copy if you miss it.

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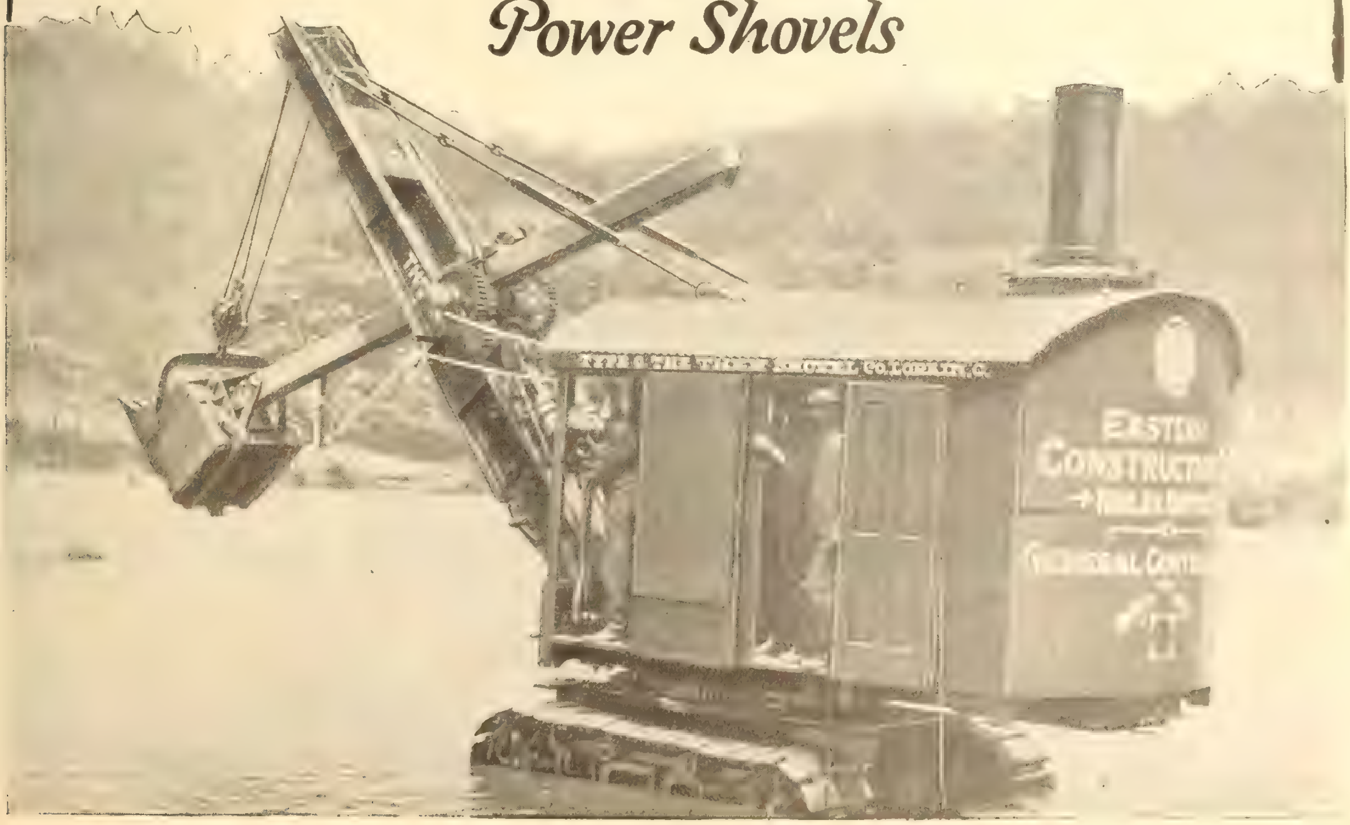

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A card will bring it.

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The "Caterpillar" excels in every field where power and endurance are demanded: logging, mining, freighting, snow removal and public works of every kind.

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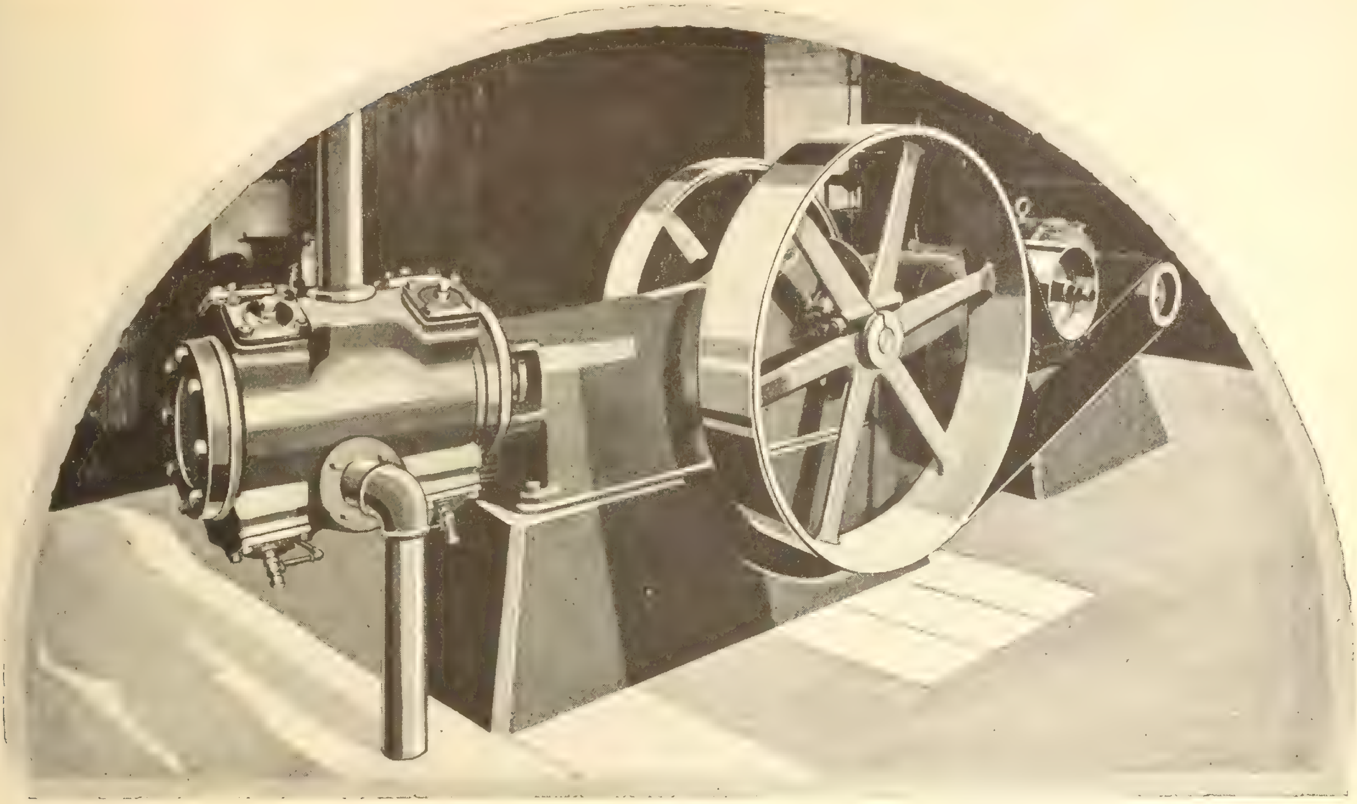

The Contractor's Compressor

The small compressor for furnishing air to three or four rock drills or pneumatic tools should be as efficient and reliable as modern design and skilled workmanship can make it.

Efficient because the lower the cost of compressing air, the greater the margin of profit on the job.

Reliable because there is usually only one compressor and if it breaks down work will be held up until repairs can be completed.

For contractors there is no simpler or better combination than an Ingersoll-Rand Class ER or FR Compressor and "Jackhamers" or Little David Air Tools.

You can always satisfy yourself, for it is an easy matter to locate installations right in your own neighborhood, where the worth of such combinations is being constantly proven.

Class ER and FR Compressors are straight-line, single-stage, double-acting units, fitted with Ingersoll-Rand Plate Valves.

They are simple, sturdy and compact in construction and reliable, automatic and economical in operation. Class ER units are furnished for long or short belt drive; Class FR for steam drive.

Write our nearest branch for bulletins and names of users in your locality.

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Ingersoll-Rand

How Many Fire Traps in Your Town?

Fire Marshal Heaton, who is a strong advocate of a more extensive use of Gypsum Plaster Board for interior partition walls, had this to say during the enquiry into the Lister Building fire: "It is no wonder that under such deplorable conditions we have such a tremendous fire loss in Ontario. I am shocked, I stand aghast at the conditions described by the witnesses. It was bad enough to have a building crowded as this one was, without having the rooms partitioned off with fibre board".

IT would be difficult indeed to find a community of any size in Canada in which there did not exist a number of buildings of the fire-trap variety. The local woodworking plant, lumber mill, tannery, shoe factory, etc., is frequently a place where the fire demon can get in his deadly work. This condition of things has suggested to some live-wire dealers a profitable field for their endeavors. Accordingly, they have canvassed the owners of these buildings, laying the Gyproc proposition before them, submitting costs and other details, and have succeeded in working up some extremely worth while business.

In a word, the facts are these: Gyproc provides a means whereby a building can be fireproofed at minimum cost—easily and efficiently.

Gyproc is the **only** wallboard on the market that is **absolutely** fireproof.

If you're not handling Gyproc products, write us for full particulars.

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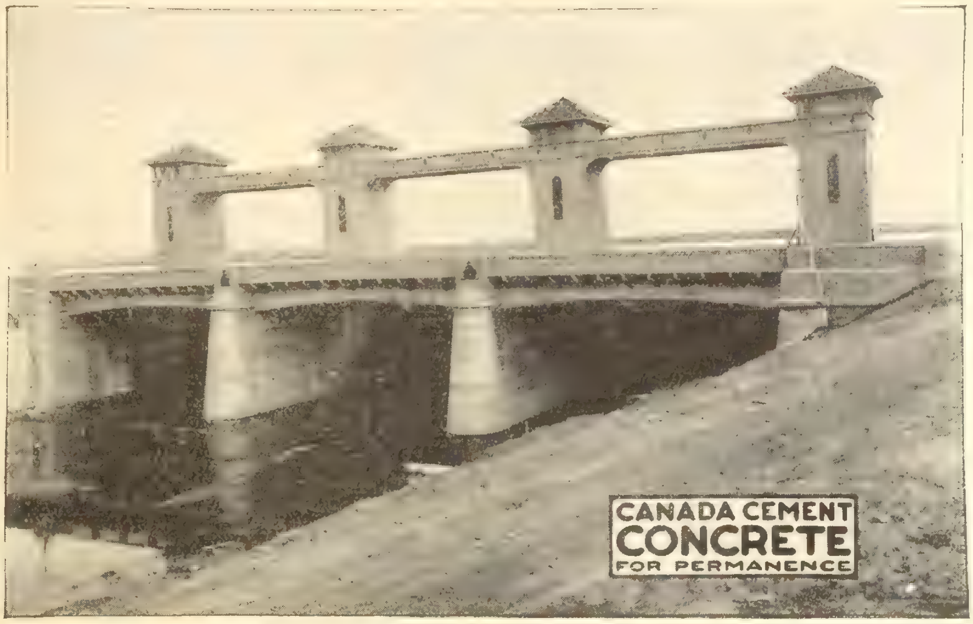

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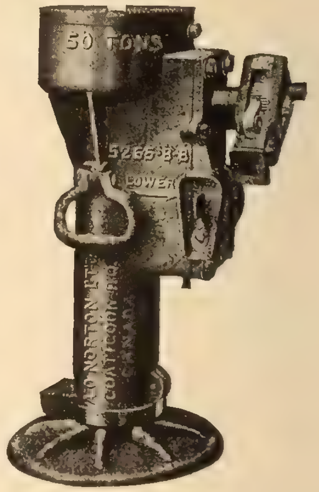

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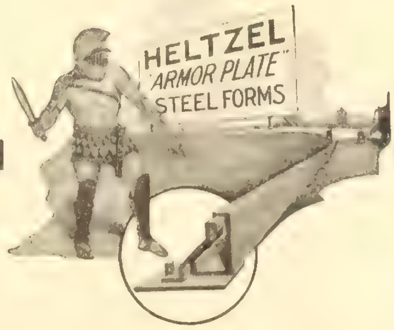

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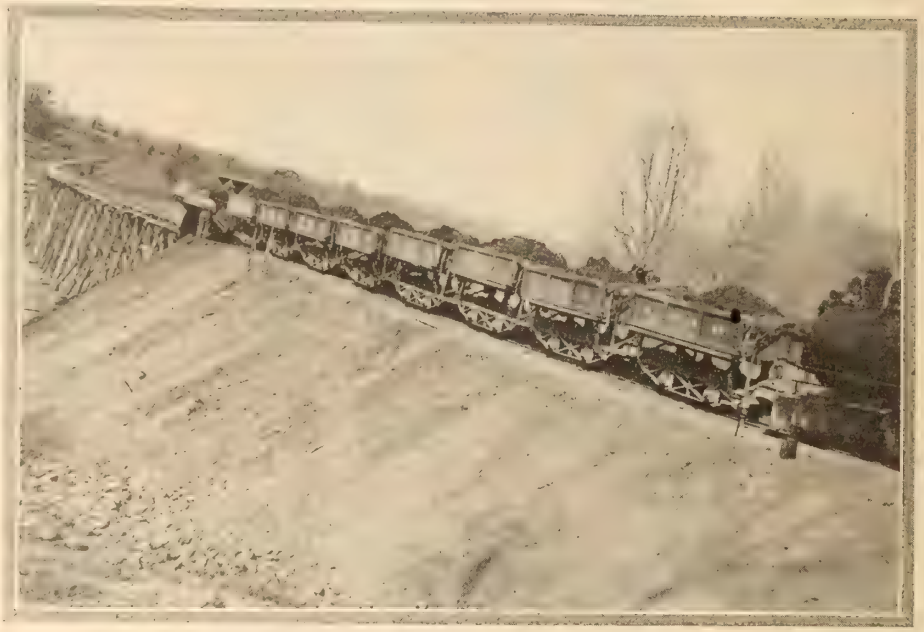

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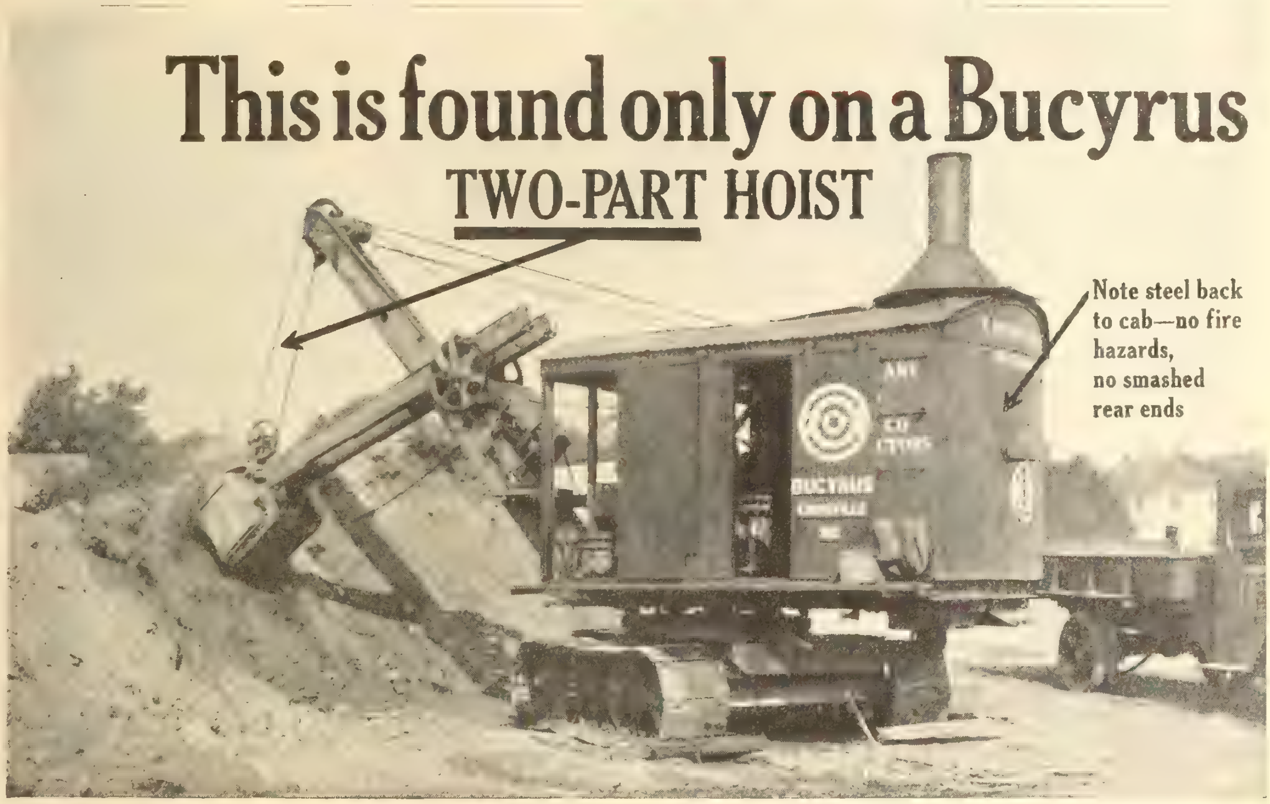

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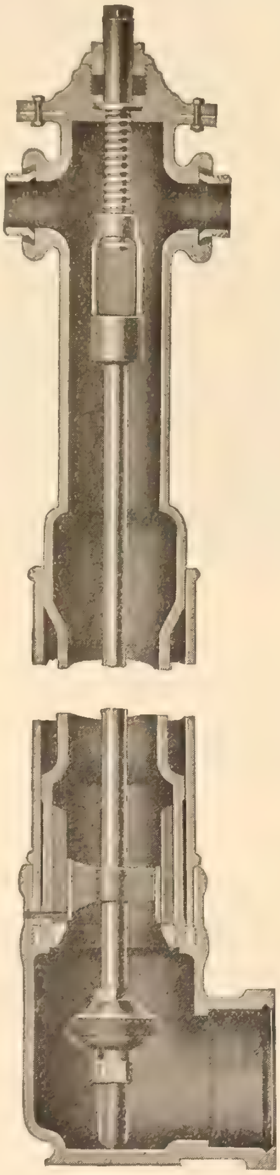

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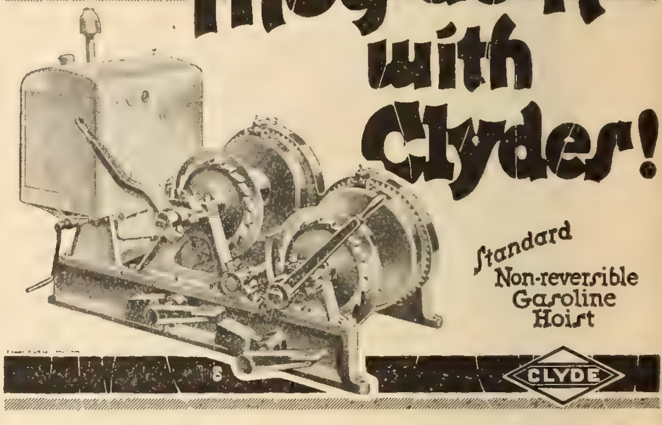

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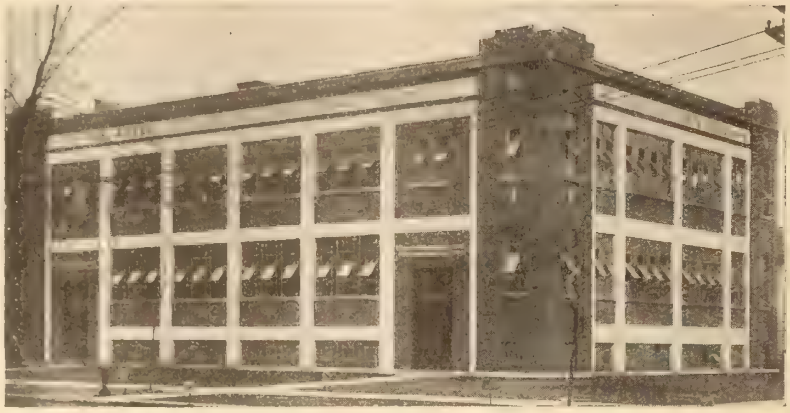

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Heavy Emigration to the United States

In connection with the recent conference held in Ottawa between representatives of the Dominion Trades' unions, the Canadian Building and Construction Industries Association, and the Minister of Labor, it was pointed out that the emigration of skilled labor to the United States was very much greater than immigration to Canada from the United States and all other countries combined. The argument was based on the figures for May of this year which are the latest available. In that month the number of carpenters and joiners that crossed to the United States from Canada was 503, masons 83, carpenters and glaziers 138, plasterers 29, plumbers 61, stone cutters 19, tinners 19, iron and steel workers 115, comon labor 2133. The total immigration figure was 18,658 which included nearly 8000 females as well as professional men and other miscellaneous labor. The number of mechanics admitted for the same year was 2367 of which all but 36 came from the British Isles, as follows: England 1007, Scotland 937, Ireland 159, Wales 28.

The figures for June are not available but it is reasonable to suppose that the exodus will be less as the summer advances. There is also a slowing up of construction work in the United States and already we hear of mechanics returning to Canada.

Great Power Development Activity in Northern Ontario Mining Fields

The announcement just made by the Hollinger Consolidated Gold Mines that work will proceed at once on the construction of a new power plant at Portage Rapids is a further indication and guarantee of the continued development of the Northern Ontario mining district. This plant has a capacity of some twenty-five thousand horse power which will be utilised to the limit. Transmission will be at 110,000 volts and the line will be eighty miles long. This contract follows on the heels of the Quinze River announcement where the Northern Canada Power Company are making a present development of 20,000 h.p., and building a transmission line a hundred and fifteen miles long; eventually their plant will be increased to 60,000 h.p. In addition, the Great Northern Power Company have started up within the last month, a 2400 h.p. unit at Indian Chutes on the Montreal River and the Northern Canada Power Company a 9,000 h.p. installation in two units at Sturgeon Falls on the Mattagami River. Thus the power capacity of this district has already been increased this year by 11,400 h.p.; there is a development under way of 45,000 h.p. and there will be easily available at least another forty thousand horse power as soon as the demand is apparent. In the Sudbury district the Wahnipitae Power Company are preparing specifications for a new power unit of about five thousand capacity with a twelve or fifteen mile power line.

Builders Want More Skilled Mechanics

The question of an active campaign for more bricklayers and plasterers by immigration to Canada was the chief subject for discussion at a conference in the office of the Minister of Labor, Ottawa, on Monday, July 16th. The meeting was attended by officials of the Departments of Labour and Immigration, and representatives from the building trades International Unions, and the Association of Canadian Building and Construction Industries.

At a previous meeting, held in March last, when representations were made to the Government regarding the establishment of an adequate system for training apprentices for the building industry, the employers claimed that to provide for the anticipated shortage for this season in certain trades, temporary relief should be secured by increased immigration of skilled workers in several trades. Questionnaires were sent out by the Employment Service of Canada to representative employers throughout Canada, and to secretaries of Labor Unions, and the replies received tabulated.

Both sides then presented their claims in memorandum to the Government, and the recent conference was called by the Minister to see if some agreement could not be reached. The employers representatives claimed that particularly in the bricklaying and plastering trades there had been a shortage of skilled men in Canada, and that this was felt principally at the present time in Ontario and Quebec. Such shortage caused delay and increased cost in building, and tended to cause building to be held up in Canadian centres, just as it had been in the United States. It also tended to cause unemployment in other trades and among unskilled labor, in periods when skilled men were not available. Even in the parts of Canada where there was at present no shortage being felt, it was because financial conditions had caused building to be curtailed, and under normal programme, there were not enough men in certain trades.

The labor men took the ground that the present flow of immigration was ample to provide for the present needs, and opposed any effort to specially induce skilled artisans to come to Canada by the Government, unless the responsibility was assumed of providing them with continuous employment. They were opposed to the bringing into the country of men to help out the "rush season" periods, and advocated that a better distribution of existing mechanics could be obtained by a registration of needs by the employers through the E.S. of C.

No agreement was arrived at, for a common course of action, and the divergent views on the question are under consideration by the Departments interested.

The Unions were represented by Messrs Tom Moore, J. F. Marsh, J. Noble, Fred Molineaux, and Thomas Izzard. The Association was represented by J. M. Pigott, J. B. Carswell, and J. C. Reilly.

Thick Mats Rut Seriously

The use of heavier materials than those specified for cold applications is favored by some engineers. This requires heating to a greater or less extent. Such a treatment produces a thicker mat and a longer period may intervene before retreatment is necessary. It has been found that as the number of retreatments increased the thickness of the bituminous mat also increased. As a consequence ruts and corrugations commence to appear. This may become so serious that the old mat must be scarified and removed.

The Week's Developments in a Nutshell

A contemporary points out that Canada owns or produces 90% of the world's cobalt, 88% of the world's asbestos, 85% of the world's nickel, 32% of the world's pulp wood, 20% of the world's lumber, 20% of the world's cured fish, 18% of the world's oats, 15% of the world's potatoes, 12% of the world's silver, 11½% of the world's wheat, 11% of the world's barley, and 4% each of the world's supply of gold and copper.

This is not a particularly strong case for Canada, either. It does not include such vast resources as her 20 million horse power of hydro electric energy; her almost boundless resources of a very fair quality of coal; her vast unbroken wheat lands; make allowance for the possibilities of our Northland in the way of mineral treasure or for the fact that Canadians themselves are the most resourceful of all nations.

Those who speak of the future of Canada in doubtful tones, do not take these items into account. Relatively, business may be slower one month than another, or one year than another, but no one can doubt that the general tendency will be upward unless he shuts his eyes to such facts as enumerated above.

During the past week there is further indication that we are temporarily marking time. It may be just the Summer effect, or it may be one of those little reactions that inevitably follow a period of greater activity. The only thing that is really certain is that it is temporary and that it is very limited in extent. There are already signs of an upward move in the money market. Our people have accumulated considerable sums of money and are looking around for the best place to spend it. This, along with the fact that most of our industries are operating on a profitable basis gives no foundation for fears of any extended depression.

There is danger however, that at the present moment this temporary slowing up may be misinterpreted by those who do not look beneath the surface. We read this week that building costs, according to certain real estate agents, are coming down right away. Any one who makes an analysis of the various factors entering into the cost of building must see at a glance that such a statement is absurd. He overlooks the fact that the cost of building in the last analysis is made up of 85% labor and 15% raw material. Do the real estate agents see any sign of a great reduction in labor costs?

The demand for houses in the large centres during the past week shows a decided slackening. This will possibly explain why real estate agents talk lower prices. On the other side of the slate, however, are such items as the demand of plumber's helpers in New York for $8.00 a day—a good wage for a journeyman.

Material prices are holding all along the line and unless there is room for a cut in the profits which owners or professional builders have been making on their houses, there is no sign of any recession in prices of houses.

The Use of Grout to Seal Permeable Foundations of Dams

The Procedure Adopted in the Construction of a Dam on the Jacques Cartier River at Pont Rouge, P. Q.—Cut off Trench Dispensed With and Construction Work Expediated

By W. S. LEA, M.E.I.C.
Of R. S. and W. S. Lea, Consulting Engineers, Montreal

I have recently read an article by Mr. Gourlay which appeared in the January 24th issue of the Contract Record, discussing principally the use of grout to seal permeable foundations of dams, and the use of thin reinforced diaphragms as core walls for earth embankments. The subject is an interesting one, dealing as it does with ways and means of making earth embankments and permeable foundations safe in dam structure.

A few years ago I had something to do with the design of two small dams in connection with which both of these methods were adopted. At the time I did not readily find published data and reports which could be safely used as a precedent or guide for the work in hand, because most of it appeared only in descriptions of works of considerable magniture, built with equipment rather too elaborate for us to duplicate. What we did do is perhaps worth while describing, because of the dearth of published data concerning the results obtained from modest efforts.

As the author of this article states, there is a dearth of published data concerning the results of the use of grout to seal permeable foundations of dams and the use of reinforced concrete diaphragms as core walls for earth embankments, particularly with regard to the manner in which these practices relate to works of modest size. Probably the majority of dams built in this country are not of large magnitude and are constructed with equipment that is simple rather than elaborate. For that reason, articles which frequently appear relating to large projects contain little of value to the designer or builder of small dams. These two articles of Mr. Lea's, describing a job of comparatively small proportions, will, therefore, be of very practical interest and should be widely read by those who have to do with either the designing or construction of small dams.

On July 28th, 1920, a contract was awarded to the W. I. Bishop Co. of Montreal for the construction of a dam on the Jacques Cartier River at Pont Rouge, P. Q., for F. W. Bird & Son. The company operates a paper mill there, situated on the west bank of the river, which flows in a southerly direction. The plant is operated by hydraulic power, the water wheels being located in a flume across the east end of the mill buildings, which extends into the stream and serves as a dam for a distance of about 50 feet. The natural head at the site is about 8 ft., increased in the original development to a total of 18 ft. by a low wooden dam extending from the northeast corner of the mill to the east bank. The alignment of the dam follows the crest of the rapids which cross the river at an angle running upstream from the mill. This old structure had served its time, and it was proposed to replace it by a concrete dam built across the river from 50 to 100 ft. below the wood dam, and between the mill and the east bank.

Seams in the Rock Open Enough to Carry Water

The bed and banks of the river at the site are of rock, stratified in horizontal layers of from one inch to six inches in thickness. Most of the seams in the rock are very fine, but it was known from previous excavations in the mill basement that some of them were open enough in places to form small channels which carried water freely. There is a low section in the crest of the rapids near the east bank of the river through which practically the total low water flow used to be diverted, and in the course of time it had worn a channel about 20 ft. wide and from 10 ft. to 15 ft. deep along the east shore of the river for about 400 ft. downstream to the foot of the rapids. The mill is located about midway down the rapids and a trailrace had been blasted out of the rock along the west bank from beneath the wheel pit to the foot of the rapids. I may say that the east bank, where there was a natural trailrace available, was not suitable for a mill site.

The total flow of the river is required to supply the draft of the wheels in the low water months. Therefore when the work started in midsummer, the bed of the river for about 100 ft. or more, both above and below the site of the new dam, was exposed rock from 5 ft. to 10 ft. above the level of the trailrace; excepting of course, the natural channel into which the tail water backed and stood almost dead, the only flow through it being the leakage from the old dam.

Provision for Increasing the Height of the Dam

The new dam has an overall length of 143 ft. and consists of 7 piers from 25 30 ft. high on 23 ft. centres. The piers rest on a concrete sill from 2 ft. to 3 ft. thick, except in the channel, where the depth of the sill is increased to 12 ft. and where the total height of the dam exceeds 40 ft. The intention is to eventually add 20 ft. to the height of both the sill and the piers.

The seams in the rock were exposed on the sides of the channel, a condition which was regarded as both a menace and a help so far as uplift pressure under the dam was concerned; because although it undoubtedly offered a favorable opportunity for the water to penetrate the foundation right against the heel of the dam, the chances were that it could readily escape near the toe of the dam through the seams exposed on the sides of both the natural channel and the tailrace.

On the whole it will be seen that the conditions were unusually favorable for the work in hand. Our chief worry was that it was already well along in August before anything could be done, the fall rains were due in October, and the Jacques Cartier was well known as a flashy river, with a flood flow of over 25,000 sec. ft., from a water-shed of 1,100 sq. miles. The contractor could team his sand to the site from pits in the vicinity, but everything else had to be brought in by rail, the cement from Exshaw, Alta., at a cost of $6.60 per bbl. Labor and materials were both scarce, and prices were at the peak at this time.

As intimated above, we were really building the substructure of a dam which would eventually have an average height of over 45 ft. and a maximum height of 60 ft. At current prices, the extent to which uplift pressure was provided against in the design was an important factor affecting the cost of both the initial and final structures. In the end, practically no allowance was made for uplift, apart from the eight 1-1/8" vertical rods placed in the nose of each pier and anchored into the rock foundation. There was little to be feared from ice pressure. The river turned through a sharp 90 deg. angle immediately above the old dam and springs along the bank kept the outer shore of the bend free from ice. As matter of fact, however, our decision concerning uplift did not mean that all the bridges were burned behind us, because it was intended during the progress of the work to try and determine the maximum uplift pressure which would prevail in the foundation from the proposed future forebay level. If this could be done, or if considerable uplift pressure were found to be unavoidable, then the design of the sills in the future dam could be modified to take care of the contingency, although it would detract to some extent from the final appearance of the dam.

No Preliminary Investigation of the Foundation

Under the circumstances attending the inception of the project, there was no opportunity to drill and test the foundation in advance of the preparation of the plans. This was one of the main reasons for letting the contract on a commission basis; there was very little about the foundation in either the plans or specifications. A concrete cut-off 5 ft. deep was shown along the heel of the dam, and it was specified that any seams below this depth would be grouted through holes drilled in the bottom of the trench to the number and depth deemed advisable after the nature of the foundation had been revealed by tests. When the work was started, it was found after shooting a couple of blasts that a cut-off trench of a reasonable width could not be provided without very close drilling. Moreover, as the rock had a tendency to shatter beyond the lines of the trench, it was decided to dispense with the cut-off and rely on grouting to seal the foundation through 2" holes drilled at 4 ft. centres in a row parallel to and about 2 ft. upstream from the heel of the dam. These holes, through which it was intended to both test and grout the foundation, are referred to as "grout" holes to distinguish them from "test" holes drilled in other places for testing purposes only. Steam, water, or air were available from the mill at suitable pressures for testing and grouting.

It was, of course, necessary to determine the elevations of the lowest seams in order to determine the depth to which the holes should be drilled, and also to determine the approximate area of the seams, particularly the upper seams, in order to fix a safe limit for the pressures applied in testing and grouting.

In nearly all the holes the water stood within 2 or 3 ft. of the surface ,and the elevations of the lowest seam in any hole could be closely determined by exhausting the water from each hole in succession, and noting the levels to which the water dropped in all the other holes and finally came to rest. It was decided in the first place to tentatively adopt 25 ft. for the depth of the holes and since, according to the tests, seams did not appear at any hole below 15 ft. from the surface, the 25 ft. drilling was adhered to throughout. In making these tests a steam ejector was used to exhaust the water from the holes.

Determining the Size of the Seams

We never succeed in getting a good idea of the areas and distribution of any of the seams, except that it was certain there were neither large nor continuous over wide areas. This became fairly apparent in testing for the elevations of the deepest seams. This test was, however, supplemented by others, in which water or air was applied under pressure to the seams, through short pipes cemented into the tops of the holes. Water was the best indicator of the capacity of the seams, as the rate of discharge could be easily metered in the supply line, but in attempting to determine their distribution air gave better results. Once the air was turned into a hole it was easy to detect its slightest escape at the other holes, on account of the distribution of the water standing in them, air bubbles in water being a very sensitive indicator.

Where the water carrying capacity of the seams is small it is feasible to determine the number and elevation of the largest of them at most of the holes with but little interference with the drilling. This can be done by first drilling and inserting the nipples in say every fourth hole in the row, so that water can be applied under pressure to one or more holes adjacent to each intermediate hole as it is being drilled. The instant each interconnecting seam is pierced by the drill will be indicated by an increase in the rate of discharge through the meter placed on the supply line.

Both steam and air pressure were used for grouting at a pressure limited to 40 lbs. per sq. inch. At this pressure scarcely two pails of grout per hole could on the average be forced into the seams. A 1:1 mixture was tried but it did not work so well as the neat cement grout. It was sluggish and too slow in responding to such pressures as we thought it safe to apply. In fact a very thin mixture had to be used before we could get the grout to appear at adjacent holes at all. I do not know the ratio of the water to the cement, but it must have been at least 5 to 1. We had no special equipment in the way of grout machines or tanks, but had facilities for quickly connecting the air or steam line to the holes and for easily controlling the pressure applied. The usual procedure was to fill the hole with grout, apply the pressure and leave it on for 15 or 20 minutes, or until the escape of air or steam at some other hole showed that the grout had been forced down below the level of a seam when the pressure line would be disconnected and the operation repeated.

Test to Determine Uplift Pressure

In addition to the row of grout holes along the heel of the dam, a number of test holes were provided both upstream and downstream for the grout holes.

The downstream row was piped through the sill of the dam. These test holes were useful in making the experiments already described, but served their real purpose in connection with the final and most important test of all, viz., the test to predetermine what the uplift pressure would be in the seams immediately below the dam under future conditions. Obviously this test was simply a matter of supplying water to the upstream holes and maintaining it there under a head equialent to the future forebay level, and at the same time noting the pressure in the holes under the dam. The fact that the water did not overflow the holes piped through the sill of the dam was proof that whatever leakage there might be past the grout holes did not at all over tax the capacity of the seams to discharge it to the tailrace or to the natural channel below the dam.

Grouting gave good results at Pont Rouge, and at much less cost than even a 5 ft. deep cut-off. Moreover, dispensing with the trench expedited the work considerably, as the contractor could start pouring the sill. as soon as the debris and loose rock were removed from the site.

Reinforced Concrete Diaphragms as Core Walls for Earth Embankments

The Cost of Plain Concrete Core Walls May be Quite High While Reinforced Diaphram Have Cost as Low as 10 per cent of the Cost of the Embankment—Examples of Successful Thin Walls

By W. S. LEA

In referring to concrete core walls, Mr. Gourlay says.—

> "A recent and authoritative handbook states that the top width of a concrete core wall should be 1½ to 3 ft., acording to the importance of the dam, and that each face should batter 1 in 10 to 1 in 20. The thickness at the level below which the trench is filled solid with concrete should be one-eighth to one-sixth the maximum depth of water. The thickness must, however, continue to increase until a sound, though not necessarily water-tight, foundation is reached."

This rule fairly expresses current practices in the design of plain concrete core walls. That is to say, some of them are made twice as heavy as others. The relative importance of the work is undoubtedly partly responsible for the adoption of such a wide range in core-wall dimensions, but the main reason for it, is that core walls are not really designed at all. The designer, it is true, is aware that owing to the settlement of the fill, due largely to saturation of the upstream embankment, the core wall is likely to be subjected to unbalanced loads, but he knows little ot their direction and less about their magnitude. It is a case where experience is not only the best but the sole guide.

No feature in the design of an earth dam offers the same opportunity for waste and economy. Leaving the cut-off and the slope paving out of the calculation, the cost of a plain concrete wall may range from less than 50% to over 100% of the cost of the embankment, according as the designer more or less arbitrarily decides to adopt the lightest or heaviest types found in current practices. And yet quite a few earth dams have been built in which a light reinforced concrete diaphragm, sometimes only 6" thick, has been adopted at a cost amounting to only 20%, or perhaps to not more than 10%, of the cost of the embankment.

Light Diaphragms are Satisfactory

So far as I could learn from enquiries made a few years ago concerning dams of this kind in the United States, where the most of them have been built, the light diaphragms have proven satisfactory. Amongst the more important of these works the following may be mentioned:—

A dam in Albany County, N. Y., designed by Solomon, Norcross & Keis of Atlanta, and built in 1911.—The width of the crest is 20 ft., the height 85 feet, the upstream and downstream slopes respectively 2-1/2: 1, and 2: 1. Each slope has an 8 ft. berm 40 ft. below the crest, and a 6" concrete diaphragm serves as a core wall, reinforced with 1/2" square bars placed in the centre of the wall on 12" centres vertically and 24" centres horizontally. I do not remember the length of this dam, but I know it was quite a big job. In this wall there is only 1.6 cu. yds. of concrete and 120 lbs. of steel per foot-run, against the 20 to 30 cu. yds. of concrete which would be required for a plain concrete wall of the dimensions commonly adopted.

Pikes Creek Reservoir Dam, Pennsylvania—This dam is 2,250 ft. long, 60 ft. high, 10 ft. wide on the crest, has 2:1 slopes, with a 10 ft. berm on the water side 30 ft. below the crest, and a 16 ft. berm downstream 35 ft. below the crest. The core wall is 9" thick, reinforced on both faces with 3/4" round bars on 5'-4" centres vertically and 30" centres horizontally. It will be noted that the vertical reinforcement is very light and this is a case where considerable distortion of the wall might be expected, because I am informed by the company's engineer that no special care was taken in building the comparatively high embankment. The filling material, a clay and gravel mixture, was dumped from a trestle or from wagons and spread, relying solely on the teaming for its consolidation.

On page 145 of the Engineering News, Vol. 1, 1908, there appears a description of the Avalon Dam, in New Mexico, built for the U. S. reclamation service in 1906. It is written by the designing engineer, Mr. B. M. Hall of Atlanta. This dam is 1.050 ft. long, 24 ft. high, and has a core wall 8" thick on top, battered to 12" at the bottom and reinforced both horizontally and vertically with 1/2" square bars at 12" centres, placed in the centre of the wall. In this article Mr. Hall argues the case for the reinforced concrete diaphragm, of which he is an advocate, and that he had faith in his convictions even at that date is evident from the design for the Carite reservoir dam in Porto Rico, described in the same article. It was proposed to build an earth embankment with a maximum height of 92 ft., a crest width of 20 ft., upstream slope 3:1, downstream slope 2:1, and provided with a 6" concrete diaphragm, reinforced vertically and horizontally with 1/2" square bars at 12" centres, placed in the centre of the wall. As a matter of fact, a puddle core was finally adopted for this dam.

Design of Diaphragms

In replying to my enquiry, Mr. Hall was good enough to give me some particulars of his experience in building light diaphragms. He now considers a minimum thickness of 9" advisable to permit of the convenient alignment of the forms and to satisfactorily consolidate the concrete against them. Referring to expansion joints, he mentions the case of the Avalon dam, where the core wall was built to its full height in advance of the embankment, stripped and left exposed to the weather for months without any serious cracks developing. In this connection I might mention the case of the Morrison Brook dam at Chatham, N. B. This dam, designed by R. S. & W. S. Lea, is 400 ft. long, has a plain concrete core wall 12" thick on top, battered 1/2" to the foot on both faces, giving a base width of 3-1/2' in its maximum height of 30 ft. The work was started late in the season, and the wall, with the exception of a gap left for the stream, was built to its full height in advance of the embankment. Vertical expansion joints were specified at 40 ft. intervals but were omitted by the contractor, and although the wall was left exposed all through the winter, no temperature cracks of any importance could be discovered the following summer.

In the Kettle Creek storage dam, designed by Mr. James A. Bell, consulting engineer, of St. Thomas, and the writer in 1920 there is a 90 ft. concrete spillway with an earth embankment on each side of it. The core wall in the embankments has a total length of 300 ft. and a maximum height of 30 ft., of which about 2/3 is above the natural surface. This wall is of 1:2:4 concrete, 12" thick, reinforced both horizontally and vertically with 3/4" square bars at 2 ft. centres, placed in the centre of the wall.

With thin walls, 12" and under, I think it is a good idea to put all the steel in the centre. It is somewhat easier to place it and much easier to pour and ram the concrete, and the steel is better protected. Moreover, for the quantity of steel the wall ought, if anything, to be stronger because the resistance of the steel to bending in either direction is greater when all the steel is placed in the centre of the wall than it is when half of the steel is placed near each face. Of course, the compressive stresses in the concrete are greater, but the diaphragms are usually so lightly reinforced that these particular stresses are not severe.

Interlocking Steel Sheet Pilings as a Seal

Apart from plain and reinforced concrete core walls, Mr. Gourlay mentions several other materials and types of construction which may serve as water-stops in earth dams. Interlocking steel sheet piling may be added to complete his summary. Where a considerable depth of water-bearing sand or gravel overlies an impervious stratum at the site of an earth dam, it is much cheaper to seal the foundation with sheet piling than by a concrete cut-off in wet excavation. It is easier to make a practically water-tight job with interlocking steel than with wood piling, although one would have more confidence in the permanence of the latter under such conditions. If it is a low dam it may prove economical, as it certainly is convenient, to drive the steel piling through the completed embankment to serve both as a core and a cut-off. The work of placing and consolidating the fill, particularly the upper portion of it, is greatly facilitated with no core wall to interfere with the teams. This procedure was recommended by R. S. & W. S. Lea for a low earth dam across the Montreal aqueduct in their report to the city of Montreal in 1919 in connection with this proposition.

The spillway was in the centre of the dam and it was proposed to insert three piles, treated with a preservative against corrosion, in each abutment with locks projecting beyond the face of the concrete, so that a water-tight connection could be conveniently made with the abutments if it should eventually prove necessary to replace the piling. Since there would be little if any circulation of the water in contact with the piling, the provision for future connections at the abutments was regarded more as a reasonable precaution than a necessity.

Successful Use of Stucco Surfaces

By A. LANGLOIS

The generally attractive and neat appearance of well done stucco work is much in favor of its use. Furthermore it adds a certain protection against weather and fire and it is to be commended to the house builder. Placed on brick it makes splendid looking and durable walls.

But the successful use of stucco depends entirely on the surface upon which it is applied. Stucco on frame construction will not add any rigidity to the building, and in this case unless it is perfectly applied it might be a failure and therefore detrimental to the material itself as well as to the users. There are examples of houses finished with stucco showing signs of advanced deterioration shortly after it has been put on, and this very likely for the only reason that some defects existed in the supporting surfaces. Then on account of the numerous uses of stucco placed on wood, principally on verandahs which are exposed to the action of the frost and consequently liable to distortion with inevitable damage to the surface in most cases, would it not be advisable, as a suggestion, that some municipal regulations be enacted by which all stucco work may be subject to inspection, that is, that all exposed surfaces to be stuccoed shall be inspected before any cement is put on.

The expense incurred from this source would certainly be compensated in the end and should be well viewed by the builders. On another hand the intending builder should avail himself of all the literature on the subject. One can get booklets giving ample data and useful information and guidance based on experiments, about how to proceed in the preparation of the different grades of stucco and about the arrangement of the surfaces upon which it is to be placed. If these are carefully followed, together with proper supervision, there seems to be no reason why success should not be obtained in all cases.

Company Incorporation

The Kenilworth Construction Co. Ltd., with head office at Hamilton, capital $60,000, to carry on a contracting business and deal in building supplies.

What Do We Know About Concrete?

A Discussion Concerning Properties and Methods of Making Concrete That Require Further Investigation—What Can be Learned from the Behaviour of Actual Structures

At the recent annual meeting of the American Society for Testing Materials one of the subjects discussed was "What properties of and methods of making concrete require further investigations." A number of interesting papers were read on the subject, two of them by prominent Canadian engineers, namely, R. B. Young Hydro Electric Power Com., and G. M. Williams of the University of Saskatchewan. Mr. P. H. Bates also presented an interesting paper on "The Future Requirements of Cement" in connection with this discussion. The substance of these three addresses has been published in the Engineering News Record and is reproduced below:

Further Production Study is Needed

By P. H. BATES
U. S. Bureau of Standards

Portland cement must have certain properties to meet certain service conditions. We are going to condense these to three conditions under which resulting cement products will be used: namely,

Class I.—Those atmospheric conditions in which the product will not be subjected to actual contact with water after making, but be subjected to only the water vapor present in the air. In this class of products we have reinforced-concrete buildings and mortars used on the interior of structures, especially as the top coat of floors.

Class II.—Those conditions in which the product is subjected continuously or intermittently to contact with water of a fair purity or low in solids composed largely of sulfates. In this class we find the greater use of cement, for it comprises such uses as in roads, mass concrete, stuccos, sewers, drain tile, etc.

Class III.—The conditions in which the product is subjected to the action of a solution of salts, especially sulfates. In this class appear concrete used in sea water and concrete used in those arid regions where the soils contain considerable amounts of sulfate salts, as our "white alkali" regions of the West.

Stone is not permanent. Any geologist will tell us that our kaolins are disintegrated granites and that water in certain places is very "hard" because of dissolved limestone. Hence, in cement and its products we are only properly concerned with a relatively permanent material—but a material which will give such adequate service, be it months or years, as coupled with its cost of installation and superiority of resulting product will justify its use.

Atmospheric Exposure

The uses indicated in our Class I may seem to be the least severe of those to which cement may be placed. But even if such is the case, it is quite evident that we are in need of much research before we have the ideal cement for such purposes. Flexibility in the use of cement entails the use of more water than we should use and consequently in certain ways—strength and shrinkage—produces an inferior product, although in other ways it is superior. But what has been done so far as the cement is concerned, to develop a cement which would possess a minimum strength reduction and a minimum increase in shrinkage with the use of increased amounts of water? We have not made any thorough or even preliminary investigation to see how the different brands of cement vary in these respects. It is now time to investigate the equality of brands exhaustively, as a preliminary step in a research tending toward developing a cement affected in the least by the use of large quantities of water.

Very closely connected with the question of excess water used to produce readily flowing concrete is that of a more "workable" one obtained without the use of water in excess or admixtures of any kind. But how many researches have we in which it has been attempted to find if we have any cements more strikingly "plastic" than the others?

All floor finishers will say that with all cements there are occasions when a non-dusting, non-cracking floor is obtained and that with certain brands the likelihood of obtaining a good floor is far greater than with others. But they are seldom sure when the desired result will be obtained, and no one has developed a test or tests that will predict this quality. A research that would show just what constituent or combination of constituents in the cement, or what phenomena in the reaction of water on these, or what physical properties of the cement, as hardness of particles or fineness of grain, produce the expected and hoped-for result, would not only enable cement to regain a favor that it has lost in this use but would also reduce the cost of floors and materially increase the use of portland cement for such purposes.

It is believed also that this same research would solve the problem confronting road builders where or when a very low atmospheric humidity exists. A number of instances of trouble have been reported of roads cracking under these conditions before final set has been obtained—and the trouble has not been due to excess water or poor choice of aggregate or poor grading of aggregate. The difficulty has been with the cement. Here again our tests are at fault. We store all test pieces of cement under close to saturated humidity conditions before and during the time of set. But much cement has to set in an atmosphere under considerably less than 50 per cent relative humidity and cannot be protected from evaporation during this period.

It has been our duty to examine the veneering of a large number of steel and concrete frame structures and we have been surprised at the relatively larger numbers of failures of the veneer on the concrete than on the steel structures. Architectural terra cotta, stone, and brick veneer show failures of a type that lead almost conclusively to the deduction that the concrete by contracting has induced strains in the veneer that have crushed it, especially when setting of the latter has been faulty due to the lack of fully embedding the individual units in the mortar.

Our present "soundness" tests are supposed to determine "constancy of volume," but this is only very relative and not near to the degree of accuracy that we must have and will ultimately have for certain types of work.

Moist Exposure

A road saturated with water may freeze and in this condition be subjected to the action of a warm sun on one side while the other remains well below freezing. A sewer is subjected to the action of water at practically all times and yet somewhat more than 50 per cent. of the cement is soluble in water. A thoroughly dry stucco may suddenly be subjected to a heavy or long rain and while saturated be frozen.

Note that the conditions here are somewhat different from those existing in the first class. It is assuming rather much to infer that a cement which will be successful under the first condition will necessarily be just as successful under the second. That we do need studies for making cement still more adaptable is realized when we examine roads or massive retaining walls or foundations or stuccos. We are confronted often with a large number of shrinkage cracks which furnish a very unsightly appearance and would seem to mark a condition which may be conducive to ultimate failure. This condition occurs even under the most careful cases of application so frequently that it must be considered as produced by some inherent quality of the cement.

Our "standard" tests for cement will not tell the whole story. The character of the grading of the aggregates and strength tests of the concrete are also insufficient. Our present methods only very roughly approximately enable us to predict the suitability of a concrete for any particular use.

Concrete through which water constantly percolates is doomed, but only locally at that point where the percolation takes place. Hydrated cement, the matrix of concrete, is just as soluble as limestone, in fact it is more soluble. It has been found by sad experience that water must be kept out of concrete and it is being done on all large jobs. With the prevention of the water percolating through the concrete, the latter is giving adequate service. But cement in itself cannot be so changed as to make the concrete impermeable. Here is a condition which requires the joint proper use of all the ingredients of concrete, cement, aggregate and water, and when so used an impermeable concrete can be obtained.

Saline Exposure

Concrete when subjected to the action of the solution of certain salts, especially sulfates, has been found to give a service which has been adversely criticised. Yet it gives a far greater service and return on the investment of installation than any other material that might be substituted for it at less, equal or greater cost.

Again we feel that the major part of such studies must be confined to the cement. If we have a matrix unaffected or but very slightly affected by these solutions, then we must of necessity assume that we would have reached the ideal condition or at least have it in sight. For we now know enough about the quality and the grading of aggregates needed for such work to be able to make the proper choce in this respect without further study. But we have such a meager amount of information in regard to the resisting qualities of cement to such salt action that this field of study may be considered a virgin one. However, we must start not with the cement as it reaches the market, but go to the plant and still further to the quarry. We must know the entire history of the concrete—assuming as is generally but erroneously done that the history of concrete starts with the delivery of the cement and aggregates to the job. We must know not only that it is a certain brand made at a certain plant but we must also know from actual observation how and from what it was made and this detailed knowledge must be obtained by some keen observer more skilled in making such observations than in making cement.

We must have tests of the cement which will give us values which are indicative of the different behaviors which cement reveals in service. However, when we have all these data we are only in the position to make concrete and feel assured that we have on file some observations which have in other cases been overlooked but which are essential. In the meantime investigations must be under way which will have for their purpose the determination of the course and the products of the reaction which takes place between the constituents of cement and water, how these are affected by the various solutions with which cement may come in contact and how the reaction may be affected by various proportions of the constituents or by the different physical characteristics under which they may exist.

There is no question but that a deductive study of concrete forces us eventually to conclude that we are grossly ignorant of cement; what it is as produced on a plant scale; what variations in ultimate quality we must expect in any plant's production from day to day; what is the nature of the reaction with water and how this reaction will deport itself in a variety of atmospheres and solutions. Some intensive work must be done that will solve these questions and enable us to produce the exact kind of cement we want at any time after having found out the kind of cement we must have for the case in question.

Those but casually acquainted with the industry are surprised that a product made to meet our present standards can be produced under such a set of widely varying plant procedures and equipment as now used. Though the product may be "standardized" it is quite evident that its methods of production are not. While it is generally believed that this wide latitude in methods does produce the same character of product, we are not convinced that such is the case, especially in view of the incompleteness of the methods used in examining the marketed product. At the present time the only incentive for study is the matter of needed economies in production, and the limited studies already made have shown the economic value of certain changes in methods—as the waste heat boiler. Furthermore, in this case it seems reasonable to believe that the required care demanded of the kiln operator, in order to insure a uniform delivery of heat to the boiler, has produced a change in the cement, more marked than is generally realized. Studies of the efficiency of the grinding apparatus, not only as to the relative operating costs of the several types of machines available, but extended, as they should be, to the efficiency of the resulting cements, would be of extreme value to both consumer and producer. How interesting would be an investigation on the properties of the resulting cements in which the sole variable in the methods of production would be the use of wet or dry raw mixes! Fuel economy demands a thorough study of all available types of kilns and furnaces and of necessity such a study must include the question of the quality of the cement produced. May not such studies result in our specifying what methods of production are desired in addition to the physical properties, just as we now specify steel of certain physical properties made by open-hearth or bessemer process?

Present Methods Often Mean Over-run Estimates

By R. B. YOUNG

Hydro-electric Power Commission of Ontario

Under certain conditions, concrete mixtures can be designed by new methods of determining proportions to give the strengths sought. Under other conditions equally likely to be met with on the job, the methods will not give the results required.

More exact methods for measuring the raw materials of concrete on the job can be studied to advantage. Under average conditions, our present methods of measuring concrete materials, particularly in the case of fine aggregate, result in lack of uniformity in the concrete mixtures, and their inherent errors tend to produce undersanded and permeable concrete more susceptible to the action of destructive agencies such as frost, alkali or sea water. Present methods are also responsible for a great many cases where contractors have overrun their estimates for cement. A 10 to 15 per cent. increase in cement requirements brought about by improper measurement of fine aggregate is not unusual.

Nor do we know all there is to be known about the laws governing mixing. The relationship between the time during which a concrete is mixed and its strength at a given period is fairly well established, but little is known as to the relative effectiveness of different mechanical mixers.

What do we know about the influence of plant layout and construction on proportioning and mixing concrete? For example, the arrangement of bin gates in stationary plants influences the absolute volume of aggregate in a measured volume, and this in turn influences the cement content and water requirements and thus the quality of the concrete. Again, with the proper consistency there seems to be a remixing action during the transfer of concrete through chutes. How much do we know about this? Are our methods of charging a mixer altogether satisfactory? They are, probably, when we consider only our present equipment; but equipment could be modified if experiments demonstrated that other methods gave better concrete or were more economical in materials and power.

Alkali Deterioration of Concrete

By G. M. WILLIAMS

University of Saskatchewan

In numerous instances, irrigation structures, foundations and other concrete works have shown signs of failure after short exposure to the salts in the soil. Various theories as to the cause of deterioration were advanced and it was first believed to be due to the crystallization of the soluble salts in the pore space of the concrete, which action was greatly accelerated by the use of poor aggregate and poor methods of preparation aad curing. The problem was further complicated by the fact that not all concretes exposed to apparently similar conditions were attacked, tending to substantiate the theory that aggregates and workmanship were to blame. The possibility that the deterioration was primarily due to reaction between the salts in solution and constituents of the cement was also advanced but was not generally accepted owing to lack of experimental verification and the knowledge that materials and workmanship were of inferior quality in some cases.

Deterioration due to alkali has generally occurred in the arid or semi-arid sections of the Western states. The weathering and breaking down of rocks by long exposure to the elements has resulted in the formation of soil, and the salts of sodium, calcium and magnesium which were once among the constituents of the rocks are now found distributed throughout the soil, usually in greatest amount in the clays and shales. While most ground waters carry in solution appreciable quantities of one or more of these salts, it is in the arid regions that concentrations are sufficiently high to result in such waters being classed as alkali waters. In the humid region, heavy rainfall for many years has washed most of these salts from the soil, but in the arid and semi-arid districts, a smaller rainfall together with soils less easily drained have resulted in the conditions as now found. The excessive application of irrigation water, together with poor drainage facilities, has resulted in a gradual raising of the soil-water level which has brought about a high concentration of salts at the ground surface and a few feet below.

Investigations to study the cause of deterioration were started in those localities where the trouble was first encountered.

All of the investigations may be considered as establishing the first phase of the investigation—definitely fixing the problem—and demonstrating the fact that disintegration is primarily a chemical action, rather than a physical disruption, and indicating the variable factors and conditions which must be met in practical work. The second phase of the work involves the discovery of means, materials and methods for eliminating the possibility of disintegration in future work.

1. In many districts of the Western states and Canada there are areas where the salt content of the soil is high and concrete cannot be used with assurance of success.

2. Study of field conditions indicates that deterioration of concrete structures is almost entirely confined to regions where the sulphate type predominates. Good quality concrete is apparently being successfully used in chloride and carbonate soils.

3. Rapidity of disintegration varies directly as the sulphate concentration.

4. Where concentrations are permanently low, good quality concrete appears to have a life which fully justifies its use.

5. Concentration of salt in ground water may be extremely variable at points short distances apart. There also appear to be seasonal or yearly variations in some districts.

6. Concrete of high quality is most resistant to action. High quality for exposure to alkaline conditions is measured by impermeability or resistance to passage of water through the mass under pressure. The one big factor necessary to secure low permea-

bility is high cement content, so that high compressive strength can generally be used as a criterion of low permeability. Consistency, within practical working limits, and graduation of aggregate are secondary factors in obtaining a concrete of low permeability.

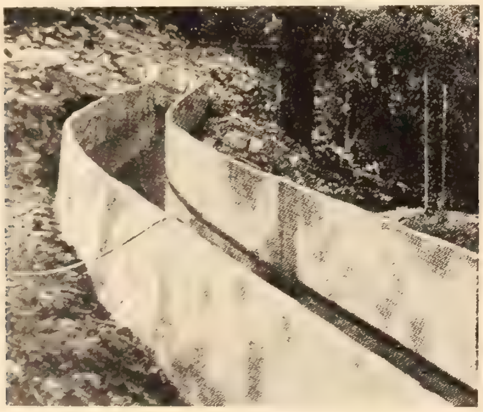
7. Where alkali cnditions are bad, the factor of safety against failure can be greatly increased by employing proper drainage precautions.

8. The employment of a membrane waterproofing may prevent action for a time at least, but such a method is not practicable under all conditions.

9. Portland cement, as now constituted, is inherently subject to attack by sulphates in the soil and ground water and the practical and final settlement of the alkali-concrete problem is dependent upon modification of, or the discovery of some material which may be added to, portland cement to make it immune to such action.

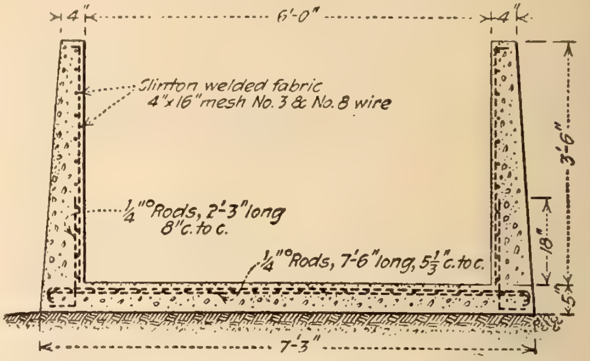
Unusual Design in Concrete Flume

A power company in California, the San Joaquin L. & P. Co., have just completed a new concrete flume which is something out of the ordnary. One of the illustrations herewith is a photograph taken from Engineering News-Record of a section of the flume built of reinforced concrete, the other picture being a cross-section of the same flume. This concrete box flume was designed without expansion joints, sufficient steel being provided so that nothing but hair-cracks is expected to develop. The reinforcing was varied to give the box additional strength where the floor was not fully supported. The reinforcing shown in the line drawing is typical. The forms were of special design; panels made of 1 in. shiplap were all 3 ft. long and 3-1/2 ft. high; to make curves with these forms of standard length, wall forms for the longer or outer side of the curves were supplemented by strips or "Dutchmen" of varying width placed between the ends of the panels.


View of concrete flume

The process of setting up forms and pouring concrete was programmed as follows: (1) the 2 x 6 in. sills were carefully set to line and grade, (2) floor reinforcing placed, (3) outside panels with cross-ties on top set in place, (4) side reinforcing, (5) inside panels, and, finally, (6) cross bracing.

The wall forms were held in place at the top by the 2 x 8-in. cross-ties bolted to the panel studs. At the bottom the outside panels were prevented from spreading by No. 10 wires laid across the sills in pairs and twisted up, after the panels were placed, around the bottoms of the panel studs. These wires extended the full width of the flume box from outside to outside. The panels were fastened to one another, at the outset, by hook bolts. Nailing blocks were soon substituted as being much faster and better suited to the use of "Dutchmen" on the curves.


4"
6'-0"
4"
Clinton welded fabric 4"x16" mesh No. 3 & No. 8 wire
1/4"° Rods, 2'-3" long 8" c. to c.
1/4"° Rods, 7'-6" long, 5 1/3" c. to c.
3'-6"
18"
5"
7'-3"
Typical flume section; grade 1 in. 675; Velocity; 5.54 ft. per sec.; flow, 100 sec. ft.; value of N. Kutter's formula, .014

Tile and Mosaic Company Organized

The J. H. Dodgson Tile & Mosaic Company, Ltd., a recently incorporated company, with office address at 745 St. Catherine St. W., Montreal, is a reorganization of the business previously carried on by Mr. J. H. Dodgson personally. The rapid growth of business during recent years necessitated expansion of the company and Mr. Dodgson has taken into the firm Mr. T. Dodgson, his brother, and Mr. Basil Howell. The company is equipped to handle the best class of tile work, specializing in fireplace construction.

Thew Shovel Construction

The Thew Shovel Company, of Lorain, Ohio, have recently issued the fourth and final folder of a series which discuss the Thew Shovel, unit by unit, beginning with the boom or business end and back through the various working parts of the turntable and truck, the entire outfit being summed up in this fourth folder. Each folder is well illustrated with sectional views of the important working parts and the text clearly outlines the function of each in the general operation. The illustrations also include many interesting views of Thews at work on various types of loading and excavating jobs.

Recent Sales of Wettlaufer Equipment

Frank Ryan, builders' supplies, 1327 Bloor St., W., Toronto, has purchased through Wettlaufer Bros. a Brownhoist shovel crane with tank tread. This is one of the latest type machines for loading and unloading cars and trucks and for digging, grading, ripping up old pavements and shovel work of all kinds. The speed, simplicity and strength of this machine has created a good deal of comment among contractors who have seen it. Wettlaufer Bros. also report the sale to Britnell & Co. Limited, builders' supplies, Yonge St., Toronto, of a Brownhoist steam locomotive crane.

How British And American Methods Compare

Road Construction and Maintenance on this Continent and in the Old Land—Engineer Tells the Institute of Transport of His Observations While Studying Highway Conditions Here

By A. DRYLAND*
County Engineer of Middlesex, England

The change which has been brought about by the introduction of the internal combustion engine has been revolutionary as regards road construction and maintenance in this country, but in America its effects have been even more momentous. In the stage of development they had reached when this epoch-making change occurred, the cities and the country were distinct entities, with little merging of one into the other, such as is common in this small country. All the industries would be in the cities, and agriculture would only need to convey its principal crops to the towns at certain periods of the year, and, distances being so great, the railways were practically the only means of communication between the cities. The highways outside the cities were mere tracks or rights-of-way on Mother Earth, affording a fairly navigable passage in the dry period of the year by the horse-drawn buggies or waggons, and in the winter months, when frozen hard and snow-covered, by means of sleighs. The need for a hard road was, therefore, little felt. When, however, the automobile came, the desire for better road communication in all weathers became an insistent demand, and during the last 10 or 12 years great strides have been made in providing good roads. Ambitious proposals, such as ocean to ocean highways, 3,000 miles in length, are now approaching fruition, and the time is not far distant when all the large cities will be linked by good roads.

Difference in Traffic

There are considerable differences to be observed in the kind of traffic and the weight of traffic units. During a tour of Canada and the Eastern States nearly two years ago I was particularly impressed by the number of light cars, and, on the contrary, the small proportion of the heavier traffic units with which we are familiar. The completeness of the street car service in the towns and the individual ownership of small cars for longer journeys has doubtless prevented the development of communal machines such as our motor omnibuses. Apart from some small single-deck 'buses on pneumatic tires, running between towns, I came across only two regular omnibus routes of any moment, one in New York and the other in Chicago. The motor lorry was then only beginning to count appreciably, and the weights of these were materially less than ours. From casual observation I should say that the heavy type of vehicle at that time would not count for more than 5 per cent of the total, whereas here we were then approaching 50 per cent. The traction engine was practically non-existent, and the steam waggon, or steel-tyred lorry, entirely so. It may be said then that the traffic difficulty in the Western Hemisphere is, so far, one of numbers rather than weight. This aggregation of vehicles is a very real difficulty in and around the large cities, both in transit and in storage. A close "procession" is the only adequate description of the method of travel in the large cities and for some few miles outside, and the other streets are full of "parked" cars.

In comparing structural and maintenance methods it is necessary to treat separately the cities and the country, there being more variation from our methods and standard in the latter than in the former.

With regard to the cities, there is considerable similarity with our own methods. Most of the street car routes are paved with setts, the track being often laid on cross sleepers set in concrete. This is a method which I have not come across in this country, and I do not think it is as good as ours, although I am bound to say it appeared to be more satisfactory than I should have deemed possible. There was, undoubtedly, some occasional displacement of the sett paving arising from movement in, or expansion of, the sleepers due to the access of moisture.

Wood-paved streets are comparatively few, and what I saw did not produce such good results as we attain. I think one reason is the use of hard pine which, like the hard wood so common in this country a few years ago, has the appearance of separate bricks or blocks instead of the "burred" even surface obtained with our creosoted deal. I gathered also they had difficulty in keeping the blocks down. The extremes of temperature and great variation of humidity are, no doubt, the principal causes of this difficulty.

Popularity of Asphalt

The favourite street pavement in America is undoubtedly what they term "sheet asphalt," which corresponds generally to what is known in this country as "asphalt macadam." It consists of a wearing surface of synthetic asphalt composed of finely graded sands and oil bitumen, laid to a thickness of 1½ to 2 inches, either on a base coat of bituminous macadam of a minimum thickness of 2 inches, but often running up to 5 or 6 inches, or far more commonly on 6 to 8 inches of not very rich but coarsely graded concrete left with a very rough surface to form a key for the asphalt. The tendency was in the direction of incorporating with the sheet asphalt a considerable proportion of granite chippings from ⅛ in. to ½ in. gauge, with a view to giving greater stability to the wearing surface and minimizing the formation of short waves or corrugations.

I formed the decided opinion that this sheet asphalt work was particularly good, and it appeared to be much more free from corrugation than similar work in this country. How much of this superiority is due to the perfection of their methods, and to the somewhat greater "hardness" of their matrix, I am unable to say, because I realize that the much less weight of their traffic units imposes a greatly decreased stress upon the wearing surface. It was a fact, however, that sheet asphalt pavements were to be seen which had been down for over 20 years and were yet in good condition, notwithstanding the extremes of temperature to which they had been subjected. Whether so "hard" a matrix as they use would be equally successful in this country with its less extreme, but far more humid, climate is open to doubt, but it is, I think, well worth trying out.

In the smaller cities and hamlets plain concrete is largely used as the pavement, extending frequently the whole width including the tram tracks. It appeared to be giving good service although its appearance was somewhat disfigured by joints and cracks.

The footway pavements in the large cities are very similar to our own, and as good, except in the suburbs, where paving was generally conspicuous by its absence, or, if present, of very restricted width.

Country Highways

As I have before indicated in this paper, the country road, until quite recently, was considered a negligible quantity, and even to-day I am informed that the "hard" roads in the United States do not amount to more than 10 per cent. of the length of their public highways. The greater portion are still what is known as "earth" roads—that is, a beaten track on Mother Earth which is occasionally "graded" or "dragged" to level down the inequalities and smooth out the ruts and pot-holes.

There are also "gravel" roads which are kept up by an occasional supply of additional fine gravel which is levelled by dragging, and this process is repeated occasionally after rain, so as to level up the surface. Attempts have been made in some cases, by oiling the surface, to render them dustless, but the process does not seem to give any very durable result. In some of the States and in Canada, they have also quite good macadamized roads which are treated with oil bitumen in the same way as we generally use tar, but I gather they preferred to use tar for the first dressing, and also in alternate years, as it has penetrating and adhesive properties not possessed by bitumen. The real hard road programme, however, which has had to be preached up and popularized in order to convert the community to expenditure on public roads—to which they had hitherto been entirely unaccustomed—is mainly concentrated on three methods, viz.—the all-concrete road, the brick road, and the bituminous road.

It will be realized that these new countries have an immense problem to face in the construction, for it amounts to that, of their entire road system. So few roads having been metalled in the pre-motor days they have no foundation to build upon, and I think it is one of the main reasons why the all-concrete road has made such great headway. It offered a method of affording at once both foundation and surface, and could be constructed out of comparatively cheap and commonly available material such as river gravel and similar deposits, and without any large proportion of skilled labour. It moreover lent itself to construction with machinery, which is so much more used in every operation than with us, stimulated mainly by the necessity to minimize costly labour.

No Foundation to Build Upon

I think a consideration of these points brings us to the primary differences between our road system and theirs. Here we have almost universally an old road bed of varying, but yet considerable, strength to build upon; there they had no such advantage. Again, we have been slow to adopt the use of machinery mainly because, until recent years, we had an adequate supply of good and cheap labour, whereas in the newer countries labour is both scarce and dear.

The all-concrete road has had an increasing vogue, growing substantially in quantity each year since the war, and is giving good service under the traffic conditions which exist. Whether it will withstand a large increase in the heavier units of traffic has yet to be seen, but American road engineers are alive to the problem they have to face, and the legislatures readily, on their instigation, pass laws governing the use of roads by vehicles, and define strictly the allowable conditions as to axle weights and speeds. It is, I think, quite certain that more attention is paid to the question of tyring and springing than in this country, with the result that the vehicular traffic of the heavy type gives the road much more chance than with us. Here the gospel is preached that we have to fit the road to the traffic and not the traffic to the road. The Americans think differently, and while they are undoubtedly working to fit the roads to carry a largely-increased amount of heavier units, they are aware there is an economical limit to the expenditure which is justifiable on construction, and they keep a tight hand on vehicle development. There is a necessity, both here and there, for building strong roads, but it is not a practicable financial proposition to build all roads of a strength to carry any possible kind of traffic, or any freak vehicle, which may be introduced.

The principal defect of the concrete road is its tendency to crack, arising from the natural forces to which it is subject. The brick road suffers in the same way and from the same cause, and I think with more disintegrating effect. I should say the brick road is not making headway, although it is favoured in the smaller towns and has a very pleasing appearance.

The bituminous road—in various forms—is extending to as great or possibly greater extent than the all-concrete road. The difficulty is to find a foundation on which to lay it. A strong endeavour is made by the "all-bitumen" advocates to fight for a bituminous concrete base with a wearing surface added of finer materials, but I think the tendency, even where bitumen is strongly in the ascendant, is to lay a base 6 in. thick of portland cement concrete with a 2 in. or 3 in. bituminous carpet thereon.

Herein is a notable difference to our own methods, as most of our bituminous work has been laid on the old macadam base, which has generally been found efficient. The Americans have utilized to a considerable extent the macadam base where it existed, but they are more wedded to the unyielding base principle than we are, hence their preference for concrete either as a surface or, at any rate, a foundation.

Another important lesson to which I desire to draw particular attention is the American organization for training in highway engineering. Every State has its laboratory for testing and scientific research. Every University has its chair of highway engineering, and every man with any pretensions to call himself a road engineer at some time in his career takes a course of study and his diploma at one of the universities. It is true that such a course of study will not, in itself, make a good engineer, but it should, and undoubtedly does, help materially in the training; and the scientific knowledge so attained, if properly applied, must lead to greater economy than our "rule of thumb" and "trial and error" methods.

Economy in Building Highway Bridges

One State Highway Department Concentrates on the Reinforced Concrete Girder Type, Which is Claimed to be More Economical in Cost at the Present Time

The Michigan State Highway Department has concentrated to a large extent on the reinforced concrete girder type of structure for bridges constructed under the direction of the State Highway department, as this type of structure more clearly fits Michigan conditions and is claimed by them more economical at the present time than other types.

In support of this last statement, some figures are provided by the highway department. Gravel may be purchased in the pit at from 10 cents to 25 cents per cubic yard, while washed, screened gravel may be secured from commercial plants at from 60 cents to 80 cents per ton. With cement furnished under state contract at $2.10 to $2.20 per barrel, the concrete price, including the reinforcing steel, for reinforced concrete superstructures is running $25 to $35 per cubic yard under normal conditions.

A 90-ft. through concrete girder with 20-ft. roadway contains about 255 cu. yd. of concrete, which gives an average cost of about $8,000 for this type of superstructure. In comparison, a 90 x 20 ft. steel truss contains about 120,000 lb. of steel, and with a present price of around 7-1/2 cents per pound erected, we have $9,000 for the steel. A reinforced concrete floor for this type of structure will run about $1,500, giving a total first cost of $10,500 for a steel truss as against $8,000 for a reinforced concrete girder. There is a further difference in cost between these two types in view of the difference in size of abutments. The top 8 ft. on an abutment for a steel truss is included in the superstructure for a 90-ft. concrete girder. The difference in maintaining cost between the two types of structures is obvious.

Some typical bridges erected in the state are briefly described below, cost figures being given:

No. 1.—This structure is a 75-ft. concrete girder with 20-ft. roadway, and has an angle of 60 deg. with the stream. There are 232 cu. yd. of concrete in the abutments and 200 cu. yd. in the superstructure. The contract was awarded in June, 1921, and was completed in September, 1922, at a total cost of $13,850. This cost includes $519 for removing the old bridge and for maintaining a temporary structure as a detour.

No. 2.—This structure, which was awarded in November, 1921, is a 75-ft. concrete girder with 24-ft. clear roadway and two 6-ft. cantilever walks, and contains a total of 731 cu. yd. of concrete. This contract was completed in November, 1922, at a cost, exclusive of lighting, of $13,200, which sum includes $400 for removing the old bridge and maintaining a temporary structure during construction.

No. 3.—This structure comprises two 75-ft. concrete girders with 18-ft. clear roadway and one 5-ft. walk. It is placed at an angle of crossing of 45 deg. The contract was awarded in January, 1922, and includes 424 cu. yd. of concrete in the substructure and 442 cu. yd. in the superstructure. The bridge was completed in November, 1922, at a total cost of $28,829, which includes $366 for removing the old bridge and $4000 for placing 5000 lin. ft. of piling.

No. 4.—This structure is of particular note in view of the span, as it is a 90-ft. concrete girder. The clear roadway is 20 ft. and provision is made for the later addition of two 5-ft walks. The angle of crossing is 50 deg. The contract was awarded in May, 1921, and includes 310 cu. yd. of concrete in the substructure and 328 cu. yd. in the superstructure. The contract was completed, except for clean up, in December, 1921, at a cost of $21,450. This price includes $1,336 for special drainage work.

No. 5.—This is one of the older arch designs. The contract was awarded in June, 1919, and there are two 70-ft. and one 75-ft. concrete arches at an angle of crossing of 70 deg. The overall width is 60 ft. 6 in., and the structure contains 3754 cu. yd. of concrete. The construction was completed in September, 1920, at a total cost of $96,728. This cost includes $3000 for removing the old bridge and maintaining a temporary foot bridge and $1,941 for a concrete retaining wall.

No. 6.—This is one of the later designs of concrete arches and is a 100-ft. arch with a 24-ft. roadway, involving 1127 cu. yd. of concrete. The contract was awarded in July, 1921, and completed in July, 1922, at a total cost of $49,265. This total cost includes $350 for removing the old bridge and $14,895 for piling and special foundation work.

Proposed Bridge Across Sydney Harbor

Sydney is the largest city in the Commonwealth of Australia. The population of the metropolitan area was 913,510 at the end of 1922 (1911, 645,133). The situation of the commercial section bears a striking resemblance to that of New York, inasmuch as it is bounded on the northern and western sides by water and on the eastern side by parks, gardens and water, thus practically forming a peninsular city. The concentration of business in this area and the demand for accommodation are causing the rapid demolition of old buildings and the erection of many structures which are being built up to the extreme height allowed by the city ordinances, 200 feet.

As a considerable portion of the population has of necessity to cross to the northern side of the harbour and the only means of transit at present is by steam passenger and vehicle ferries, the problem of safe carriage is a serious one. These ferries continually cross the stream of traffic in and out of the port and there is great danger of accident.

For many years the danger of this traffic and the need of a bridge or tunnel has been recognized. Owing to the depth of water crossing the harbour, and the sharp rise of the land on the northern side, it was generally agreed that a bridge was the only solution. The large cost, estimated at £5,000,000, however, precluded its construction, but the present government has decided that it cannot longer be delayed, and an enabling act was passed last year. Plans and specifications were then sent abroad to all bridge building centres (including Canada), and tenders close on the 30th November next.

The act provided for a tax of one halfpenny in the £1 on the unimproved capital value of all lands within certain sections which will benefit by the construction of the bridge, and the first year's levy has already been collected. The tax will not pay for the full cost and the balance will be borne by the government.

Whether the bridge will be of a cantilever or arch design is yet to be decided. According to the plans for the cantilever bridge, the shore and harbour arms will be each 500 feet long, the harbour arms supporting a central span of 1,600 feet. The three approach spans on either side of the main spans will be each 200 feet long, the remainder of the approaches consisting of concrete arches. This bridge will carry four railway tracks, a main roadway 57 feet wide, and two footways each 10 feet wide. The top of the cantilever arm will be 450 feet above sea level.

A bridge of the arch design will afford the same accommodation for traffice as the cantilever. The span from shore to shore will be 1,650 feet, with a clear headway for shipping of 170 feet throughout a length of 600 feet. The top of the arch will be 470 feet above sea level. The main piers will be founded on solid rock about 20 feet below sea level.

Provision has been made that during the building of the bridge there will be no inconvenience to shipping or ferry traffic.

Tractive Resistance of Three Types of Road Surface

By A. B. CUTTER,
City Engineer, Everett, Washington

Having noticed more or less conflicting reports as to relative tractive resistance of rigid and non-rigid and gravel types of road surfaces, I arranged during the past winter for the making of exhaustive tests in the states of Washington, Oregon and California, and believe the result will be of public interest. There being no snow in either of the above Pacific Coast States, the test could be made during the winter months.

Representing the three general types of road surfaces, sections of road were selected for each type as follows:

1. Rigid, portland cement concrete.
2. Non-rigid type—Warrenite-Bitulithic.
3. Gravel or earth.

The rules governing the comparative tests were as follows:

(a) The distance of each test was 100 miles of continuous operation, this being regarded as a distance sufficient to accurately record the gasoline consumption and produce a fair average. In some previously reported tests the mileages have been so small and so variable as to provide grave danger of inaccuracy.

(b) Make test on road surfaces in good condition but having had at least three years' practical use.

(c) In each state use the same automobile for comparative test of the several types, but different machines were used for comparative tests in some of the several states.

(d) Uniform speed of not less than twenty nor more than thirty miles per hour.

(e) Record the date, location, speed and gasoline consumption on exactly one hundred miles, as shown by speedometer on the car.

The results were as follows:

Washington

It was not practicable to here make test on gravel road, but exhaustive tests on the other surfaces were as follows:

	Bitulithic	Portland Cement Concrete
Date of test	February 7, 1923	February 8, 1923
Air temperature	40 to 50° F.	40 to 50° F.
Tire inflation	60 lbs. rear, 55 lbs. front	60 lbs. rear, 55 lbs. front
Running time 100 m.	3 hrs. 45 min.	3 hrs. 45 min.
Average speed per hr.	26.7 miles	26.7 miles
Gasoline consumed	5.5 gals.	5.5 gals.
Miles per gal. gasoline	18.2	18.2

Oregon

	Bitulithic	Portland Cement Concrete	Gravel
Date	Jan. 25, 1923	Jan. 30, 1923	Jan. 31, 1923
Weather	Cool-moderate wind	Cool-moderate wind	Cool and fair
Tire inflation	60 lbs. rear 55 lbs. front	60 lbs. rear 55 lbs. front	60 lbs. rear 55 lbs. front
Running time 100 m.	4 hrs. 35 min.	4 hrs. 25 min.	4 hrs. 40 min.
Average speed per hr.	21.9 miles	22.7 miles	21.4 miles
Gasoline consumed	5.25 gals.	5.5 gals.	7.0 gals.
Miles per gal. gasoline	19.05	18.18	14.28

California

	Warrenite-Bitulithic	Portland Cement Concrete	Gravel
Date	Feb. 3, 1923	Feb. 3, 1923	Feb. 1, 1923
Speed	15 to 20 m.p.h.	15 to 20 m.p.h.	15 to 20 m.p.h.
Weather	Fair	Fair	Fair
Temperature	45 to 70° F.	45 to 75° F.	55 to 70° F.
Gasoline consumed	7.1 gals.	7 gals.	7.8 gals.
Miles per gal. gasoline	14.08	14.28	12.95

Conclusions

1. Whatever reports may have been made or may be made in the future by parties interested to have one or another type of road show the most favorable gasoline consumption test, the above tests clearly show that:

(a) Between portland cement concrete and Warrenite-Bitulithic roads tested under uniform conditions, there is practically no difference in gasoline consumption.

(b) On gravel or macadam roads **in good condition**, the gasoline consumption is from 10% to 35% greater than on either Warrenite-Bitulithic or portland cement concrete road surfaces.

(c)) Tests being made on road surfaces in good condition, of course the gasoline consumption would be relatively increased if the road surfaces are in bad condition.

(d) Under modern volume of traffic, good roads rapidly pay for themselves in economy of gasoline consumption and the same holds true in economy of tire and other automobile wear and tear. For instance, given a road carrying an average of 2,000 vehicles per day or 730,000 vehicles per year, and calculating from the Oregon test above, we find with all the road surfaces in good condition that:

On Warrenite-Bitulithic and portland cement concrete roads the gasoline consumption is about 730,000 ÷ 19 = 38,400 gals., which at 30 cts. per gal. equals $11,520.00 for gasoline per mile of road per annum.

On gravel roads, 730,000 ÷ 14 = 52,000 gals., which at 30 cts. is equal to $15,600.00 for gasoline per mile of road per annum.

The saving of gasoline by hard surface roads is 13,600 gals. or $4,080.00 per mile of road per annum.

2. The relative saving in wear and tear on tires and other automobile parts cannot be computed, but economy of high type roads and of keeping roads ıı cost (to say nothing of wear and tear on nerves of users) is beyond question.

Excellent House Sanitation in Montreal

Paper Read at the Last Convention of the Public Health Service of the Province of Quebec by Mr. A. Cousineau, Sanitary Engineer of Montreal, Discusses the Functions of the Local Department of Salubrity

Following is a summary of a paper on House Sanitation in Montreal, prepared by Mr. A. Cousineau, sanitary engineer of the city of Montreal, and read at the last convention of the Public Health Service of the Province of Quebec.

After briefly reviewing the operation and general duties of the numerous branches of the city of Montreal Board of Health, Mr. Cousineau explained more fully the functioning of his department which looks after sanitation in residences, public buildings and shops, adding suggestions concerning some desirable improvements in his branch of the service.

The functions of the Department of Salubrity in large cities are many and most important. This department deals with all cases where public health is involved, and concerns all that may be related to the general health of a city, but it deals more particularly with the inspection of residences, public buildings, churches, schools, theatres, and shops, and also with all building projects. It makes investigations in all causes of insalubrity. Its operations are divided into three classes:

1. The expansion of all building jrojects.
2. Investigations concerning all causes of insalubrity or nuisances.
3. Sanitary inspection.

1. Building Projects.

The regulations governing construction in the city of Montreal, depend on a special service known as the Department of Building Inspection, having a personnel composed of engineers, architects and inspectors. It has authority to enforce the regulations dealing with solidity, accident causes and the proceedings that the builder has to comply with to obtain his building permit.

Apart from the question of solidity and architecture, there is the sanitary question which in all cases must be closely attended to. In all cities of Quebec, having a population of 10,000 or over, the Superior Board of Health of the Province compels all intending builders to submit their plans to competent authority for approval, for all the details regarding ventilation, lighting, means of preventing dampness and emanations from the soil to penetrate into the building, the free space to be left about a house and finally the means for the proper discharge of used rain water.

The city of Montreal complies with the above mentioned requirements, and all applications for building and alteration permits are granted only with the official consent of the Board of Health. Furthermore, the city has prescribed certain restrictions depending exclusively on the Board, their object being:

1. To ascertain by a theoretical and practical examination, the competence of the contractor or plumber of the sanitary part of the construction
2. To compel inspection during progress of erection.
3. Final tests of the plumbing fixtures, etc.

In consequence of these last mentioned regulations, a permit for all work the cost of which is to exceed $10.00 must be obtained and it is only granted to licensed and duly qualified parties. These regulations are also in force in many municipalities of the Province.

In order to limit to a minimum at the beginning, the uniformity of requirements, a provincial code of plumbing works similar to these in force in most of the "State Boards" of the United States, would be desirable.

For the last few years, the supervision of the erection of residences has become more difficult, the principal causes being the increase in the cost of materials and labor; the supply of houses being insufficient to meet the demand, a number of existing houses have been transformed into several residences, the owners taking advantage of the situation at the same time to increase their revenues. Others prepare projects which give little guarantee on several points, these often retaining the services of an architect only when they find it impossible to themselves secure the necessary approval of their plans. Many also often take all possible means to evade the regulations without any regard to the consequences and the general interest.

The restrictions concerning the free space to be left about a house and necessary for its proper ventilation and lighting, are not always understood, and builders are inclined to be satisfied to simply keep within the civil requirements relating to openings on the neighbor's property. But this wrong idea will gradually disappear with the adoption of regulations determining the percentage of free space to be utilized on each lot, and prescribing the size of the yards proportionate to the height of the building or house.

It has been suggested at a previous convention of the Provincial Board of Health, that regulations be enacted to the effect that a builder would be required to obtain a permit of occupation before taking possession of his house. A law of this kind would have a tendency to force the builder to follow more closely and accurately the plans and specifications submitted.

or at least to make thereinto, only authorized modifications, exposing himself otherwise to a refusal to occupy his house.

2. The Nuisances

The sub-division of the department dealing with the nuisances or causes of insalubrity, is one of considerable importance if we take into consideration that at Montreal approximately 10,000 complaints of nuisances are received every year. The procedure followed in the handling of these cases is the following: The complaint as soon as received, either verbally or by telephone or letter, is given an order number and the case is intrusted to an inspector who must report upon it at noon if the complaint is received in the morning, or the next morning if it is received in the afternoon. The nuisances so brought to the attention of the authorities are classes in two categories. There are those of constitutional order, that is, those resulting from a defect in the construction, and these of acquired insalubrity. The former are a matter for the owner, whereas the latter, which concern the tenant, are easily suppressed in most cases.

The removal of the nuisances of a constitutional order require a more elaborate procedure however, especially when the owner concerned is called upon to execute considerable repairs. The description of the nuisance or plumbing defect, and other information necessary for their location and identification, are forwarded to the Inspector's office, and if interference is thought necessary, a special form of notification signed by the Superintendent and the Director, is served on the responsible party. At the expiration of the granted delay, the Inspector makes a second visit and if the transgressor has not complied with the order sent him, a second notice can be served or court proceedings immediately instituted if, in the opinion of the superintendent, the seriousness of the offence warrants such action. In certain cases when the infractor has previously been found guilty of a similar offence, he is at once summoned to the Courts.

Apart from the nuisances just referred to, there are those for which the municipal authorities are themselves responsible. In these may be included certain delays in the promptness to drain the new districts, this being often due to the rapid expansion of the city, or often also due to lack of modern methods and equipment in handling the public discharges. The difficulties to be overcome here are more of an economical order than technical, but to improve the sanitary conditions existing in the old wards and to prevent a recurrence of the same errors in the future, a general unit plan of the city, often demanded by the citizens, is necessary. Such a plan would co-ordinate with the Public Utilities Services and would obviate to a great extent many causes of insalubrity.

3. Sanitary Inspection

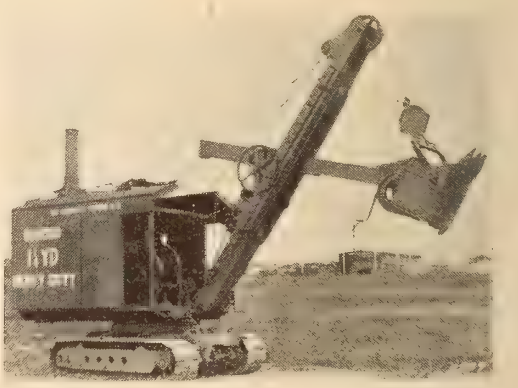
The sanitary inspection as required by Law is regularly and systematically done. Special recording forms have been prepared for each category of inspection, and the notice, communications, etc., concerning one particular building, are kept to form a separate file for that particular case. For some time past the inspection of residences has been the object of a special attention with a view of establishing a sanitary system of references. A form or card of information is made for each residence which contains 36 questions comprising, apart from general information, names, location, rent, etc., the lighting means direct or borrowed, available space, state of plumbing fixtures and drainage, causes of dampness, heating system, general condition of upkeep and cleanliness, etc. The number of people living in each residence is also recorded together with statistics regarding sickness and mortality. The results obtained from such a system has already proved its usefulness and importance in determining the causes of insalubrity, and recommendation has been made by the Anti-Tuberculosis Committee to the Superior Board of Health of the Province, urging a similar system for all municipalities of 2,000 or more population.

In concluding, Mr. Cousineau emphasized the fact that the unsanitary house is greatly responsible for the exterior causes of tuberculosis, and a campaign of education coupled with the application of a system of sanitary reference for residences similar to the one just referred to would soon stamp out all infectious sources and causes of insalubrity.

Machinery & Equipment

New 1-1/4 yd. Heavy Duty Steam Shovel

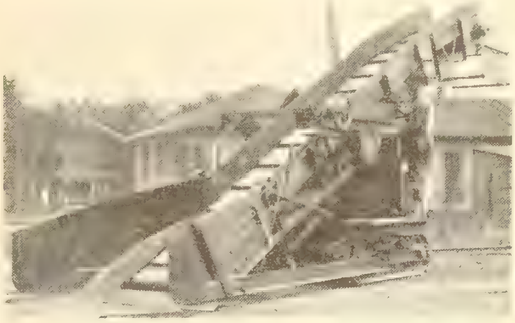
The Osgood Company have added another unit to their line of revolving steam shovels in the new 1-1/4-yd. heavy duty shovel which is now ready for the market. This shovel is of the full revolving type and has incorporated in its construction features of proven merit, such as horizontal hoisting engines; sub-merged tube type vertical boiler; centering gudgeon for connecting main body casting to path gear; simplified continuous tread mounting; power steering on both continuous tread and traction mounting; double geared shipper shaft; automatic trip rope tension, etc. The hoisting, swinging and crowding engines are of ample size and stroke to furnish a surplus of power for all ordinary uses. The entire machine is designed for heavy work with over-sized shaftings and large bearing surfaces at points of great stress. The boom and dipper handle are built up of white oak timber, shrouded with plate steel and the whole securely bolted together forming solid units. The dipper handle is fitted with manganese steel racking which operates over manganese steel pinions on the double geared shipper shaft. The double geared shipper shaft insures equal application of power to the dipper handle racks, thus eliminating to a great extent side strain and twisting. The objective in designing the machine has been to produce a revolving steam shovel of the 1-1/4 yd. class suitable for the



heavy work that it will be called upon to do without in any way sacrificing its speed, simplicity or ease of operation. In general design the machine is modeled after the Osgood 3/4 yd. heavy duty machine which has proven itself in the construction field.

The Barber-Greene Snow Loader a Money Saver

The Ottawa Electric Railway Company recently placed an order for a Barber-Greene snow loader, as illustrated in the accompanying photograph. The snow loaders manufactured by this company since 1920 appear to have been giving very satisfactory service. For example, an 8-yard truck can be filled in 2-1/2 minutes either from a pile or a windrow. The cost of operation is small; a 25 horse power gas engine operates the elevator and consumes less than one gallon of gasoline per hour. The loader requires the services of four men—one engineer to operate the loader, one helper for the engineer, who manipulates the plow, and two laborers. It is claimed that the loader operates equally well at all temperatures and whether the snow is light or slushy. A written report from the Supt. of Streets, Chicago, states that they are effecting a labor saving of better than $450.00 per eight hour shift.



Barber-Greene Arrow Loader

Water Storage Increased by New Dam at Ocean Falls, B. C.

By H. H. COOLIDGE

Pacific Mills Limited, at Ocean Falls, B. C., manufacturers of ground wood pulp are adding to their power capacity. This involves raising the height of the impounding dam about 15 ft. The Electrical News of July 15 gives the following information in connection with the work which is at present under way:

After carefully checking the strength of the penstocks, turbine wheels, etc., it was decided that 15 feet was the greatest increase advisable. The weakest points in the penstocks, the branch openings to the water wheel, have been reinforced by constructing reinforced concrete rings around both main pipe and branches for the distance required. The raising of the dam is practically complete. In raising it, a few changes in profile and arrangement have been made. The profile remains about the same excepting that it has been widened sufficiently to take care of the additional head of water to be retained. The bulkhead sections have been lengthened and raised to elevation 270 as against elevation 251 previously, and the spillway elevation is now at elevation 260 as against elevation 245 previously. This difference of ten feet existing between spillway and bulkhead as against 6 feet difference before, is to allow the discharge of the water to be taken care of on 365 feet of spillway instead of 412 feet as above.

View of dam looking south, June 17, 1923

In the head gate section, the old head gates are being used again. The stands were allowed to remain in place until the bulkhead was raised above them, and were then placed in their new position, the only additional requirements being four stems 19 feet each in length. The 18 inch sluice or by pass gates were considered insufficiently strong for the additional head and were replaced with new gates by a diver. New stems and stands were required with these. The head gates, by pass gates and stands were all furnished by the Coffin Valve Co.

In pouring the dam while binding the new concrete to the old, extreme care was used to provide against water pressure that might exist between the two pours. The surface of the old dam was carefully chipped. A cut off trench was cut along the top of the old dam and a series of horizontal trenches, leading to vertical trenches draining to the toe of the dam, were cut in the face in which were laid porous tile 3 in. and 6 in. in diameter, covered with 1-4 mix of cement and coarse sand so as to allow water to pass through into the tile. To strengthen the bond, holes were drilled at about 4 ft. 6 in. centres and deformed bars grouted in; the exposed ends of these project about five feet into the new concrete.

A 1-3-5 mixture of concrete has been used and about 14,000 cu. yd. of concrete poured as against 20,000 cu. yd. in the older structure. Some plums have been used but owing to the necessity of speeding up the work during the last two months, and the difficulty in procuring and handling these, the percentage is very small.

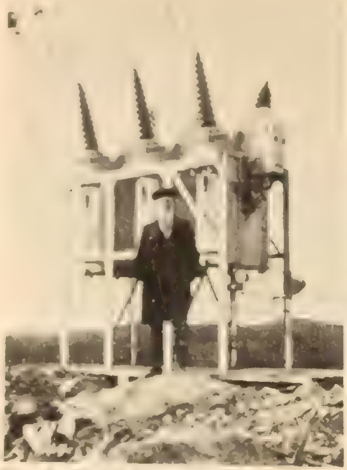
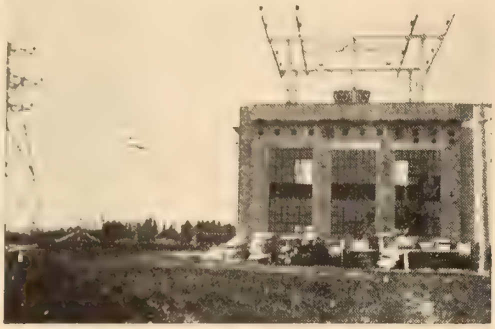


Fig. 3—60.000 Volt Oil Circuit Breaker


Fairville Sub-station

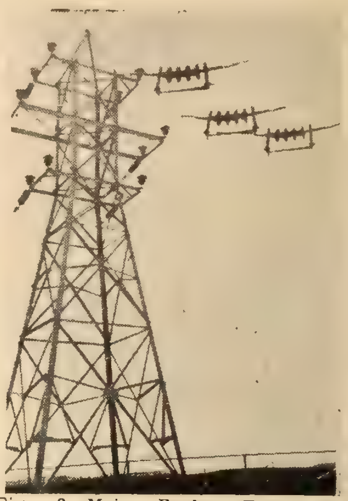


Fig. 2—Main Feeder Tower for Fairville Sub-station

Power Line Construction in New Brunswick

Musquash Development Makes Available Hydro Power on Large Scale —Power Line Construction Work by Stephen Construction Co.

By the time this appears in print St. John, N.B., will be using power from the Musquash development. This consummation has been delayed by the recent spring floods, but part of the civic distribution system has been completed, and current from that section is available.

Construction work has been carried out by the Stephen Construction Company of St. John. They are placing all the poles except the fancy standards and are stringing wires for the lighting system. This work is being done under the direction of the provincial hydro commission. Mr. Willet, secretary for the St. John Power Company, states that the work will be completed as soon as possible. It will not be necessary to finish any great part of the system, the idea being to start serving consumers as soon as meters are installed. Power will be sold at a 4 cent rate.

The accompanying illustrations show the various phases of the construction work which it is necessary to undertake for the distribution of Musquash power. Fig. No. 1 shows substation at Fairville, N.B. This steps a transmission voltage of 66,000 down for local use. Another part of the installation at Fairville is shown in Fig. 2. This represents the main feeder, showing the main aerial switch on the 66,000 volt system. The Fairville sub-station steps the power down to 2300 volts at which voltage it is distributed up along the St. John as far as Wellsford, N.B.

Fig. No. 3 shows a 66,000 volt oil circuit breaker. This relates to the installation which has been supplying current since early this year, viz., that line which supplies power up along the Kennabecasis River as far as the city of Moncton.

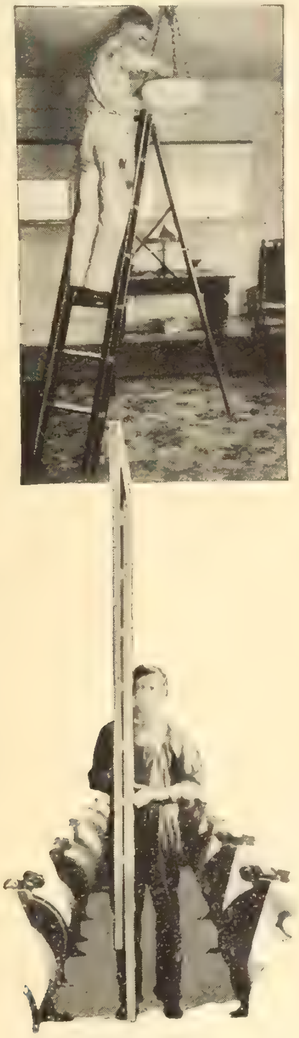
For these photographs we are indebted to Mr. C. W. Griffiths, contractor-dealer, of St. John, N.B. Mr. Griffiths is very enthusiastic about the recent development and states that a plentitude of electric energy is bound to stimulate sales of electrical appliances and generally help the electrical business along.

Citizens of St. John are very much interested in the progress that is being made towards the installation of the lighting system. The new system calls for three times as many standards with three times the capacity of that heretofore in use. W. I. Snook has special contract for the erection of the aerial street lighting system.

Hints for the Contractor

The Peerless "Eversafe" Folding Ladder

As its name implies it folds. The rails consist of two halves of one half round thoroughly seasoned perfectly straight Spruce grooved to receive the rungs when the ladder is folded. The rungs are made of thoroughly seasoned straight grained second growth hickory with a steel ferrule on each end. Each end is drilled for a 1/4-inch pin sharpened on one end and the other end flattened to form a head to prevent turning or coming out. One side of groove on each rail is drilled to receive this pin; the other end of rung is inserted in groove, the steel pin is put in and driven home in other side of groove. Each end of rung being fastened in same way. The opposite end of each rail is left round a short distance back so when ladder is to be moved from one location to another one side is simply raised and the rungs fold into the groove, the rails coming together. It is simply a matter of moving a round pole the length of the ladder.



Two views of Peerless folding ladders

There is an automatic lock at the bottom of the ladder to insure safety when open.

The step ladders are also of the folding type; each end of each step is hinged to the rails and the A frame in back is hinged and the telescoping with a locking device, which when the ladder is set up for use securely locks the ladder holding it very rigid.

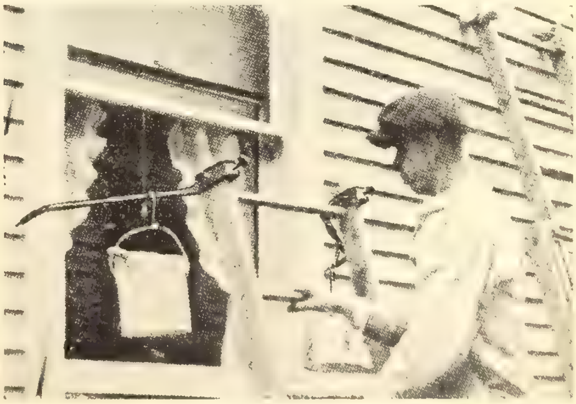
This ladder of length wanted, when not in use, is folded into a bundle the width of which is about five times the thickness of material used and can be set back out of the way with the straight ladder and the hazard of tripping over ladders leaning against the wall is avoided

It is thoroughly rigid

They are manufactured by the Peerless Folding Ladder Co. of Greenville, S.C.

Giving Arms to a Ladder

The illustration shows a pair of utility and safety brackets for a ladder. The arms or brackets are of the best quality ductile steel, and being alike in construction, fit either side of the ladder, being held securely in place with top and side thumb screws. There is a clip on the arm of the bracket which keeps paint pail or firepot from sliding, and the arrangement gives a freedom to the person on the ladder which is absent when the ladder is used in the ordinary way. It comes in useful when painting, roofing, washing windows, fitting or hanging screens, awnings, storm sash,



Making the ladder safe and at the same time giving the mechanic more working space replacing glass—in fact, for any work requiring the use of a ladder. The farmer finds it particularly useful, as in connection with silos, and the tinsmith secures better footing and room for his work. It was a painter's idea, this safety arm or bracket, and when he had perfected it he found he could accomplish more work in five hours on a ladder equipped with the new device than he could accomplish in eight hours without it. These new safety brackets or arms ought to prove a good investment for anyone using a ladder in their work, and as they are simply and durably made, their usefulness is unlimited.—American Builder.

Excavating Equipment Bulletin

The Pawling & Harnischfeger Company, Milwaukee, Wisconsin, manufacturers of cranes and excavators, have recently issued new bulletins featuring P & H excavating equipment. Their 58—X Bulletin features the clamshell, dragline, orange peel, backfiller, crane hook, electro-magnet and pile driving rig, with which the P & H excavators may be equipped. The 16—X Bulletin features P & H trenching machinery. The Testimonial Bulletin is made up of a series of letters written by some of the users of P & H machinery.

Contract for Maritime Home for Girls, Truro, N.S., outside of the plumbing and heating, has been secured by MacKenzie Bros. of New Glasgow, N.S. The plumbing and heating is to be done by F. Dexter & Company of Truro, N.S. Architect, E. D. Vernon, Truro, N.S.

Making Use of Old Bricks

This man is cleaning the mortar off used bricks. He cleans on an average of 5,000 bricks a day. The outfit is operated by an air-cooled engine. The rotating disc of the apparatus proper is filled with staggered teeth that trim off the mortar. Pressure of the hand or foot pushes the brick against the cutters, and off comes the mortar. The average cost for renewing the cutters is less than 8 cents per thousand bricks cleaned.—American Builder.

Cleaning the mortar off bricks at the rate of 5000 per day

The Ottawa Gravel & Construction company has been incorporated with a capital of $50,000 to carry on general construction work. The address given is Marshall Rathwell, at Navan, Ont.

No. 92

Canada's Engineers—W. J. Baird

Mr. W. J. Baird, who was recently appointed drainage engineer of Scarboro Township, Ont., was born in the township and educated in the public schools of the township, at Malvern Collegiate and the University of Toronto, graduating from the latter in Civil Engineering in the year 1910. During the summers of his last two years at the University, 1909 and 1910, he was employed with Speight & VanNostrand, Ontario Land Surveyors, of Toronto, and following his graduation he became connected with Mr. S. B. Code, at Smith's Falls, Ont, on drainage and municipal engineering work. He qualified as an Ontario Land Surveyor in 1912 and as a Dominion Land Surveyor in 1913. During the period 1912-1914 Mr. Baird was connected with the Toronto firm of land surveyors, R. R. Grant & Company.

From 1914 to 1919 Mr. Baird was on Overseas service with the Canadian Army Service Corps, Canadian Field and Royal Garrison Artillery and on his return in 1919 he rejoined the R. R. Grant Company. In 1920 he took over the land surveying business of this company and operated under the firm name of W. J. Baird & Company. In 1922 he formed a partnership with F. H. Mucklestone, O.L.S., under the firm name of Baird & Mucklestone, which firm is at present operating, with head office at 1194 Danforth Ave., Toronto.

Mr. W. J. Baird

Tenders on Concrete Base

The Trend of the Bids on Recent Jobs Awarded in the City of Chatham, Ont.—Figures for Labor Only

The tabulation below shows some interesting figures in connection with tenders for concrete pavement base and curbs in the city of Chatham, Ont. The bid prices are for labor only, the city supplying all material and putting on a sheet of asphalt top by day labor with a municipal plant. The tables show how the different contractors compare in the estimates of cost. In each case the lowest tenderer on the separte bid basis was awarded the contract. On the Queen St. South job this was the Geo. W. Cutter Contracting Co., while on the others, the successful tenderer was the Western Construction Co.

Separate Bids for Concrete Base (Labor Only)

		Contractor "A"		Contractor "B"		Contractor "C"		Contractor "D"		City Engineer	
STREET	Estimated Quantities	Unit Price	Totals	Unit Price	Totals	Unit Price	Totals	Unit Price	Totals	Unit Price	Totals
Queen St. South	10900 sq. yds.	$0.78	$8,432.00	$1.48	$16,132.08	$1.30	$14,170.00	$0.78	$8,432.00	$1.20	$13,080.00
	4625′ lin. curb	.18	832.50	.26	1,202.50	.18	823.50	.17	786.25	.22	1,017.50
	4600′ steel curb	.04	184.00	.03	138.00	.05	230.00	.02	92.00	.12	552.00
	Guard fence 530′		357.00		250.00		130.00		363.00		300.00
C.W.&L.E. Rly.	1704 cu. yds. grad.	.54	920.16	.85	1,448.40	.62	1,056,48	.55	937.20	.80	1,363.20
	Totals:—		$10,725.66		$19,370.98		$16,418.98		$10,610.45		$16,312.70
St. Clair St. N.	3415 c. yds.	$0.63	$2,151.45	$0.81	$2,766.15	$0.75	$2,561.25	$0.70	$2,390.50	$0.78	$2,663.70
	2820′ lin. curb	.18	507.60	.26	733.20	.16	451.20	.19	535.80	.18	507.60
	2820′ steel curb	.04	112.80	.03	84.60	.05	141.00	.02	56.40	.12	338.40
	Totals:—		$2,771.85		$3,583.95		$3,153,45		$2,985.70		$3,509.70
Elizabeth Street	4600 sq. yds.	$0.58	$2,668.00	$0.81	$3,726.00	$0.60	$2,760.00	$0.66	$3,036.00	$0.73	$3,478.00
	3950′ curb	.18	711.00	.26	1,027.00	.16	632.00	.18	711.00	.18	711.00
	Totals:—		$3,379.00		$4,793.00		$3,392.00		$3,747.00		$4,189.00
Colborne Street	3720 sq. yds.	$0.58	$2,157.60	$0.81	$3,013.20	$0.62	$2,306.40	$0.70	$2,604.00	$0.70	$2,604.00
	2102′ curb	.18	654.12	.26	944.84	.16	581.44	.19	690.45	.18	654.12
	Totals:—		$2,811.72		$3,958.04		$2,887.84		$3,294.46		$3,258.12
Barthe Street	2617 sq. yds.	$0.58	$1,517.86	$0.81	$2,119.77	$0.60	$1,570.20	$0.65	$1,701.05	$0.70	$1,831.90
	2102′ curb	.18	378.36	.26	546.52	.16	336.32	.18	378.36	18	378.36
	Totals:—		$1,896.22		$2,666.29		$1,906.52		$2,079.41		$2,210.26
Total of Separate Bids:—			$21,584.45		$34,332.26		$27,758.79		$22,714.02		$29,478.00

Bulk Bids for Concrete Base (Labor only)

		Contractor "A"		Contractor "B"		Contractor "C"		Contractor "D"			
STREET	Estimated Quantities	Bulk Price	Totals	Bulk Price	Totals	Bulk Price	Totals	Bulk Price	Totals	Bulk Price	Totals
Queen St. South	10900 sq. yds.	$0.66	$7,194.00	$0.81	$8.829.00	No bulk		$0.68	$7,412.00	$0.84	
	4625′ lin. curb	.18	832.50	.26	1,202.50	price as-		.16¾	774.69	.18	
	4600′ steel curb	.04	184.00	.03	138.00	sume sim-		.02	92.00	.12	
	Guard fence 530′		357.00		250.00	ate bid		.55	937.00	.80	
C.W.&L.E. Rly.	1704 cu. yds. grad.	.54	920.16	.85	1,448.40	to separ-			363.00		$300.00
						ate bid		.55	937.20	.80	
	Total:—		$9,487.66		$11,867.90	$16,418.98			$9,578.89		
St. Clair St. N.	3415 c. yds.	$0.66	$2,253.90	$0.81	$2,766.15	do		$0.68	$2,322.20	$0.84	
	2820′ lin. curb	.18	507.60	.26	733.20			.16¾	472.35	.18	
	2820′ steel curb	.04	96.80	.03	84.20			.02	56.40	.12	
	Total:—		$2,858.30		$3,583.95	$3,153.45			$2,850.95		
Elizabeth Street	4600 sq. yds.	$0.66	$3,036.00	$0.81	$3,726.00	do		$0.68	$3,128.00	$0.84	
	3950′ curb	.18	711.00	.26	1,027.00			.16¾	661.62	.18	
	Total:—		$3,737.00		$4,753.00	$3,392.00			$3,789.62		
Colborne Street	3720 sq. yds.	$0.66	$2,455.20	$0.81	$3,013.20	do		$0.68	$2,529.60	$0.84	
	2102′ curb	.18	654.12	.26	944.84			16¾	608.69	.18	
	Total:—		$3,109.32		$3,958.04	$2,887.84			$3,138.29		
Barthe Street	2617 sq. yds.	$0.66	$1,727.22	$0.81	$2,119.77	do		$0.68	$1,779.55	$0.84	
	2102′ curb	.18	378.36	.26	546.52			16¾	352.08	.18	
	Total:—		$2,105.58		$2,666.29	$1,906.52			$2,131.61		
						(No bulk bid)					
Total Bulk Bids.			$21,307.86		$26,829.18	$27,758.79			$21,489.39		

CONSTRUCTIONAL ACTIVITY

Period of July 18 to July 24, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Creemore, Ont.
Messrs. James, Proctor & Redfern Ltd., engineers, 36 Toronto St., Toronto, are preparing plans for extension of the local water works system. Clerk, Jno. M[illegible]

Dunnville, Ont.
Tenders are being received by John Clark, clerk of Dunnville, until July 30, for 18,000 sq. yds. of concrete pavement on Broad St. Plans and specifications with the resident engineer, E. H. Hinchcliffe, Dunnville, with the clerk and with the engineering firm of Frank Barber & Associates, 40 Jarvis St., Toronto.

Elmira, Ont.
Tenders are being received by the town clerk, J. H. Ruppell, until July 28 for 1,984 ft. of 8 in. sanitary sewer. Engineer, Herbert Johnston, 63 Frederick St., Kitchener, Ont.

Hamilton, Ont.
The city council here is considering the extension of Aberdeen Ave. Engineer, W. L. McFaul; clerk, S. H. Kent.

Harriston, Ont.
The town council is considering the question of increasing the town's water supply. Mayor, J. H. Fawcett.

Georgetown, Ont.
Tenders are being received until July 27 for concrete pavement here. Details and plans with the clerk, Dr. F. L. Heath and engineer, Roy F. Smith, Dundas St., Oakville, Ont.

Goderich, Ont.
A start is to be made at once on the following sewer work by day labor: Cayley St., 380 ft., costing $433.00; Anglesea St., 1,700 ft., $1,797; Quebec St., 1,366 ft., $2,300. Engineer, Mr. Johnstone.

Lac St. Louis, P. Q.
The Provincial Department of Roads is receiving tenders until August 7, through the deputy minister, J. L. Boulanger, Parliament Bldgs., Quebec, for 4.10 miles of oil macadam pavement on the Laprairie-Valleyfield route. Plans and specifications with the Department.

St. Athanase, P. Q.
Tenders are being received by J. L. Boulanger, deputy minister of roads, Parliament Buildings, Quebec until August 7 for the construction of oil macadam pavement, 1-1/5 miles, on the Iverville-St. Albans route. Plans and specifications with the Department of Roads, Quebec.

St. Timothee, P. Q.
Tenders are being received by J. L. Boulanger, deputy minister of highways, Parliament Buildings, Quebec, until August 7, for the construction of an oil macadam pavement, 2.07 miles, on the Laprairie-Valleyfield route. Plans and specifications at the Department of Roads, Quebec.

Simcoe, Ont.
The town council are contemplating an extension of the storm sewer system on Chapel St., from Green St. to Head St. Tile manhole tops and grates for catchbasins will also be required.

Walkerville and Ford, Ont.
These municipalities are considering the construction of a new traffic subway on Ottawa St. Clerk of Walkerville, A. E. Cook; clerk of Ford, J. F. Foster.

Windsor, Ont.
The city council at Windsor are contemplating the paving of Lillian St. from the end of the present pavement to Giles Blvd. Pavement would be 24 ft. wide. City Clerk, Miss M. A. Dickson.

CONTRACTS AWARDED

Etobicoke Township, Ont.
Louis Sacco, 596 Ferry St., Niagara Falls, Ont., has been awarded contract by the local town council for the laying of watermains in the Earlwood Park Area and O'Connor Subdivision, at a cost of $40,000. Engineers, James, Proctor & Redfern, 36 Toronto St., Toronto.

Ford, Ont.
The Cadwell Sand & Gravel Company, 228 Sandwich St. W., Windsor, has been awarded the contract for reinforced concrete pavement 18 ft. wide on Pilette Road, from the G. T. R. tracks to Tecumseh Road, a distance of 1 mile.

Mimico, Ont.
The Standard Construction Co. Ltd., Mimico Beach, Ont., have the contract for the construction of pavements in the town, of concrete base with bituminous top.

Sainte Dorothee Parish, P. Q.
Messrs. Belanger & Sicotte, 83 Craig St. W., Montreal, have the contract for the repair of macadamized roads in this district, at $30,567.84.

Sandwich, Ont.
Tenders have been awarded for paving work by the town council as follows and work will be commenced at once:
Fanchette St., $4,341.30, C. W. Cadwell, Sandwich St., Windsor; Detroit St., $6.-513.40, Rosedale Ave., $9,865.50. Alexander Ave.,$6,896.70, Peter St., $4,784.50, King St. $14,920.80. Bloomfield Ave., $5,-271, S. P. West, Sandwich, Ont.
L. J. Ryan, Oak Ave., Windsor, has been awarded the contract for concrete walks here.

The town council has awarded tenders for watermains to the Webster Construction Co. Ltd., 134 Darling St., London.

Thornbury, Ont.
The Hyland Construction Co., Mary St., Toronto, has been awarded contract for the installation of a water works system to cost $20,000 for the town of Thornbury. Engineers, James, Proctor & Redfern, 36 Toronto St., Toronto.

Trenton, Ont.
The town council has awarded the contract for sewers to Frank Bumbaco, Herchimer St. Belleville, Ont., at $10,000.

Waterloo, Ont.
Contract for paving Duke, George, Willow, Herbert and Park Streets has been let to the Standard Paving Ltd., Central Chambers, Ottawa.

Weston, Ont.
W. E. Taylor, 22 Falcon St., Toronto, has been awarded the tender for the laying of sewers on Main, Arthur, Springhurst, Macdonald, Rosemount, John & Denison streets, at $8,327.

York Twp., Ont.
The township council has let the following contracts for asphalt pavements: Coxwell Ave. & Kilbary Rd., $6,200, A. Simpson, 227 Wychwood Ave; Donlands Ave., $2,500, D. McKay, 289 Ashdale Ave.; Sammon Ave, $4,300, Canadian Construction Co., Confederation Life Bldg., Toronto, also contract for storm sewer, $1,350 to Murphy Contracting Co., 8 Wychwood Park.

Railroads, Bridges and Wharves

Burlington Beach, Ont.
The Hamilton Harbor Commission, 47½ Main St. E., Hamilton, will shortly commence work on the pier here, involving the removal of the north side of the present pier and the building of short piers on each side of bridge. The channel will also be widened on the east and west sides of the bridge to a width of 300 ft. and deepened to 30 ft.

Gainsboro Twp.
The township council are having plans drawn for 5 bridges. Engineer, F. N. Rutherford, 24 Queen St., St. Catharines. Clerk, S. W. Freure.

Grondines, P. Q.
Tenders are being received by R. C. Desrochers, secretary, Dom. Dep't. of Public Works, Parliament Bldgs., Ottawa, until noon August 8 for the completion of wharf here . Plans and specifications with the department at Ottawa, at the offices of the district engineers, Post Office Bldg., Three Rivers; Post Office, Quebec; Shaughnessy Bldg., Montreal, and Post Office at Gondines.

Hilliardton, Ont.
Tenders are being received by H. F. McNaughten, secretary of the Provincial Dep't. of Public Works, Parliament Buildings, Toronto, until July 31, for the construction of sub-structure and erection of the steel super-structure of White River Bridge here. Plans and specifications with chief engineer of the Department at Toronto and Public Works Fore-

man D. H. McIntosh, New Liskeard, Ont.

Wentworth County, Ont.
The Hamilton & Wentworth Highways Commission are receiving tenders until noon, July 27, for the construction of (1) Carlisle bridge, 24 ft. span, 24 ft. roadway; (2) Gage Ave. bridge, 20 ft. span, 28 ft. roadway. Plans and specifications are with the secretary of the commission, Mr. John E. Peart, Court house, Hamilton and with the county engineer, Hugh A. Lumsden.

CONTRACTS AWARDED

Assiniboia Line (C.P.R.) Sask.
Hurst Engineering & Construction Co. Ltd., 402 Scott Bldg., Winnipeg, have the contract for repairs to timber trestle bridge for the Canadian Pacific Railway on the above line.

Beaverton, Ont.
W. G. Gibson. Port Hope, Ont., has been awarded the contract for the erection of a concrete bridge here, by the county of Ontario, at a cost of $12,661.

Edam, Sask.
Contract for the improvement of roads from Edam to Mervin, Sask., has been awarded to Mr. H. S. Stewart, Battleford, Sask.

Estevan, Sask.
Contract for improvement of road from Estevan, west, has been awarded to Mr. Andrew Gottselig, of Regina.

Etobicoke Township, Ont.
The township council has awarded the tender for a reinforced concrete bridge to Angelo Cavotti, 257 Euclid Ave., Toronto.

Markham Township, Ont.
The Patterson Construction Company, c/o G. A. M. Davidson, township clerk, Unionville, Ont., has been awarded the contract for a reinforced concrete bridge by the township council.

Morris, Man.
Messrs. Lacour & Schioler, 187 Lyle St., St. James Man., have the contract for a bridge for the town of Morris, at $22,262.

North York, Ont.
Township council has awarded contract for Weverley Park Blvd. paving to the Warren Bituminous Paving Co. of Ontario, Ltd., 54 University Ave., Toronto.

Whitby, Ont.
The Dom. Department of Public Works, Ottawa, have awarded the contract for reconstruction of piers here to P. Charleson, 179 Gilmour St., Ottawa at $12,000.

Public Buildings, Churches and Schools

Ailsa Craig, Ont.
Tenders are being received, no closing date set, by the chairman of the Building Committee of the Ailsa Craig Odd Fellows Society, Mr. T. Stephenson, for a two-storey and basement building, 60 x 75, of hollow tile and brick construction estimated to cost $20,000. Plans and specifications with the chairman. Architect, H. C. McBridge. Molsons Bank Bldg., London.

Ansonville, Ont.
The ratepayers here recently carried a by-law authorizing the expenditure of $10,000 to provide a town and fire-hall.

Aylmer, Ont.
The town council at Aylmer are contemplating a 2-storey addition to the local high school, to cost $10,000.

Ford, Ont.
Plans are being prepared by Nicholas & Sheppard, 15 Sandwich St., for a $210,000 school building on Drouillard Rd., for the local Public School Board.

Kingston, Ont.
Stevens & Lee, 62 Charles St. E., Toronto, are preparing plans for a Clinic Building for the Kingston General Hospital, estimated to cost $35,000. Tenders may be called next month.

London, Ont.
Messrs. Watt & Blackwell, architects, Bank of Toronto Chambers, are preparing plans for a $300,000 arean at Tecumseh Park for a local syndicate. Building will be 131 x 242 ft., of steel frame and steel roofing. Tenders will be called in about two weeks.

Montreal, P. Q.
The parish of St. Brigide, Dorchester St. E., will let the following trades in connection with repairs to the parish church on Maisonneuve St.: roofing, electrical work, plastering, heating, marble and tiling. Steel beams are being installed in the interior of the church. The general contractor is Albert Deschamps, 1177 Delorimer St.

Mount Royal, P. Q.
The following sub-trades have been let in connection with $40,000 addition to school building here for the Protestant School Bd., 39 Belmont St.: steel, Steel Company of Canada, Ltd., 1272 Notre Dame W.; roofing, G. W. Reed & Co., 37 St. Antoine St.; electrical work, Collyer & Brock, 131 St. Alexander St.; plumbing and heating, Hickey & Aubert, 93 Dominion St.; painting, Wm. Noseworthy, & Sons, 165 Bank St., and millwork, Daniel Cream Lumber, St. James St. G. C. is Bremner Norris Ltd., 65 Victoria St. and architect, F. G. Robb, 127 Stanley St.

Newcastle, N. B.
Tenders are being received to July 21 for the erection of a school building on Regent St. for the local R. C. Church. Architect. F. Neil Brodie, 42 Princess St., St. John, N. B. One storey, 85 x 85 ft., stone and brick construction.

Ottawa, Ont.
J. M. Lyle, architect, 230 Bloor St. W., Toronto is preparing plans for a $100,000 bank building here for the Bank of Nova Scotia, 39 King St. W., Toronto. Building to be one storey, 60 x 100, with high ceiling.

Port Burwell, Ont.
The local school board is receiving competitive plans through the secretary, Mr. A. R. Wright, for an 8-room public school building to cost $20,000.

Quebec, P. Q.
A public hall is being erected on St. Gabriel St., at a cost of $10,000, for Mrs. J. B. Carette, 469 St. John St. The work is being done by day labor.

St. Stephen, N. B.
F. Neil Brodie, 42 Princess St., St. John, is preparing plans for the new $100,000 Gilbert W. Ganong Memorial school building for the local school board.

Saskatoon, Sask.
Plans are being prepared and tenders will be called shortly for $300,000 tuberculosis sanitorium at Wellington Park. to be built by the Prov. Dep't. of Public works. The building will 3 storeys, 200 x 60 ft., with two wings, 90 x 50 ft., or fireproof construction. Architect, M. W. Sharan, Parliament Bldgs., Regina

Scarboro, Ont.
Bulk and separate tenders for steel, masonry, brick and carpentry work are being received until August 1, by the architect,J. M. Cowan, 991 Bay St., Toronto, in connection with 3-storey and basement addition to the college building of the China Missions Corp., at Scarboro Bluffs, estimated to cost $80,000.

Sherbrooke, P. Q.
St. Charles Seminary, Sherbrooke, is contemplating the building of an addition to seminary on Marquette St., to cost about $150,000.

The E. T. Agricultural Association contemplate the erection of an arena at the Fair Grounds to Cost $40,000. Architect not appointed. Secretary, Sidney Francis.

Springhill, N. S.
Plans are being prepared for a $20,000 addition to the hospital here.

Plans are being prepared by Mr. Fairn, architect, for 6-room brick school building to the local School Board, to cost $30,000.

Tecumseh, Ont.
Plans are being prepared by Mr. Gilbert J. P. Jacques, 3 Ouellette Ave., Windsor, Ont., for a 6-room addition to the school of the Tecumseh Separate School Board. Secretary of the board, Dr. Lacoffe, Tecumseh.

Toronto, Ont.
J. M. Jeffrey, Confederation Life Bldg., Toronto, is preparing plans for alterations costing $25,000 to theatre building at 25 Adelaide St. W., for the Famous Players Canadian Corporation Ltd., Royal Bank Bldg.

John Copp, 31 Balmoral Ave., is building an addition to bowling alleys at 2419 Yonge St., for Jas. Pears, Jr., 214 Eglinton Ave. W., at a cost of $20,000

The Dominion Realty Co., 23 King St. W., are receiving tenders for an addition to the Canadian Bank of Commerce at the corner of Bloor & Yonge Sts., Toronto, estimated to cost $25,000.

Tenders are being received by C. F. Taylor, 83 Pendrith St., for the plastering, plumbing, drainage and concrete trades in connection with church for the Advent Christian Church, on Crawford St. Architect, T. H. Capes, 66 Hayden st.

Valleyfield, P. Q.
The local school board are contemplating the erection of a school building here Architect, J. O. Turgeon, 55 St. Francois Xavier St.

Vancouver, B. C.
Plans are being prepared for a programme of repairs, to cost $35,000, to various schools for the Vancouver School

[illegible] Hamilton & Dunsmuir Sts. Ar[illegible] School Board [illegible] is preparing [illegible] to the Vancouver General Hospital. The building will be one storey, [illegible] x 100 ft., reinforced concrete construction.

Woodstock, Ont.

Plans and specifications for the proposed $100,000 addition to Central School here are with the architect, J. H. Grenell, [illegible] St. and with MacLean Building Reports, Ltd., 345 Adelaide St. W. Toronto. Tenders are being received by the secretary of the Board of Education, S. Nethercott, 36 Wellington St. W. until Aug. 2 for this building.

Tenders are being received until noon August 2, by S. Nethercott, 36 Wellington St. N., secretary of the Board of Education, for an 8-room addition to the Central School, estimated to cost $100,000. The building will be 2 storeys and basement, 8 rooms, brick construction.

York Township, Ont.

Messrs. Burden & Gouinlock, architects, 101 King W., Toronto, are receiving tenders until noon, July 30, for all trades in the erection of a 4-room addition to the "John R. Wilcox" school at Fairbank. Plans and specifications with the architects.

CONTRACTS AWARDED

Charlottetown, P.E.I.

Messrs. Phillips & Clarke, general contractors, have the contract for the brick and steel work for the new R. C. Hospital, at $100,000. Contracts for the balance of trades not let yet. The approximate cost of the hospital will be $250,000.

Messrs. Phillips & Clarke have the contract for a new front addition to St. Peter's Anglican Church here.

Fairville, N. B.

The Maritime Construction Company, Fairville, N. B., has been awarded the general contract for fire station here for the Councillors Parish of Lancaster, at $16,045. The company is in the market for cement and lumber.

Kitchener, Ont.

The general contract for the construction of the new St. Mary's hospital here for the Sisters of St. Joseph, Hamilton, was let recently to W. M. Sutherland Co. Ltd., of Toronto, for $258,800. The contract covers the excavating, carpentry, plastering, painting glazing and roofing. Architects, Watt & Blackwell Bank of Toronto Bldg., London, Ont.

London, Ont.

R. G. Wilson & Son, 398 Talbot St. have general contract for the building of gymnasium for the Askin Methodist Church here, to cost $15,000. The plumbing trade has been let to Eggett & co., 336 Ridout St. and the electrical work to Bowley Electric Co., 306 Dundas St.

Lunenburg, N. S.

Messrs. Russell & Macaulay, 5 Walker St., Halifax, have the general contract for the erection of masonic temple here for the Unity Masonic Building Co. Ltd., president, W. E. Knock, Lunenburg. The building will cost $25,000 and was designed by S. P. Dumaresq, George St., Halifax.

Oshawa, Ont.

The local school board has awarded the general contract for the construction of public school here to Gay Co. Ltd., Bruce St. The building will contain 10 rooms and will be of reinforced concrete and brick construction and will cost $79,000.

Ottawa, Ont.

The following additional sub-trades have been let in connection with the $2,500,000 public hospital at Carling & Parkdale Avenues: reinforcing steel for Nurses' Home, Dominion Reinforcing Co., Birks Bldg.; electrical work, Marchand Electric Co., Bank National Bldg.; plumbing and heating for Nurses' Home, W. G. Edge Co., 142 Bank St.

Cuthbertson & Clarke, 143 Hawthorne Ave., have been awarded the general contract and Murphy & Morrow, Billings Bridge, the plastering contract in connection with $5,000 hall for the Rockcliffe Preparatory School, at Rockcliffe.

Port Colborne, Ont.

Wm. Traynor has the contract for ventilating equipment and Peter Beam the contract for plastering in connection with the St. Patrick's parish hall on Clarence St.

Quebec, P. Q.

The following trades have been let in connection with new $97,000 school building in Notre Dame du Chemin Parish for the local school board: carpentry and structural steel, Delphee Maranda, 812½ St. Valier St., at $19,319; masonry, cut stone and reinforced concrete, Emile Cote, Gregorie Montmorency, $4,252; plumbing and electrical work, P. P. Giguere Co. Ltd., 56 des Fosses St., $16,460; galvanized iron roofing, Omer Barbeau, 154 Franklin St., $2,070; painting and glass, Ovide Lachance, Levis, P. Q., $2,300, and steel sash, Richard & Frere, 553 St. Valier St.

Rimouski, P. Q.

Additional contract for steel stairs for the new seminary building here costing $600,000, has been awarded to the Vulcan Steel & Iron Works, 1608 St. Denis St. Montreal. Pierre Levesque, 115 St. John St., Quebec, P. Q., is the architect.

St. Anne de Beaupre, P. Q.

The following sub-trades have been let in connection with new monastery building for the Redemptorist Fathers here: cut stone, Deschambault Quarry Corp., Deschambault, P. Q.; electric and plumbing, E. Marie, Quebec, P. Q.; heating, Domestic engineering Works Ltd., Lachine; tiling, Dussard, Mongeau & Joly Co., Montreal; carpentry, plastering, painting, and glazing is being done by day labor.

St. Catharines, Ont.

Additional sub-trades in connection with the $35,000 addition to Queen St. Baptist Church sunday school building have been awarded as follows: plumbing, heating and sheet metal, Jno. Peart, 36 Queen St; electrical, C. Widdicombe, Stuart Ave.

St. Johns, P. Q.

Alfred Pion, 70 St. James St., Montreal, has been awarded the general contract for alterations to R. C. church here, to cost $60,000. He will let sub-trades.

Saskatoon, Sask.

The following sub-trades have been awarded in connection with school being built by A. W. Cassidy & Co. for the Saskatoon Public Board, at a cost of $29,785: plumbing and heating, Beaton & Brady, $5,000; electrical work, Dawson Electric Co., $649.25; painting, R. H. Crossman, $1,185, all of Saskatoon.

Sault Ste. Marie, Ont.

Messrs. Dunseath & McClary, Spring St., have the plumbing contract and O. C. Carney, Queen St., the contract for wiring at the new $35,000 "Gibson Memorial" Nurses' Home here.

Springhill, N. S.

W. A. Munro, contractor of St. John, N. B., has the contract for a theatre building at Springhill, N. S. Concrete foundations, steel and wood frame, 99 x 65 ft., to cost $20,000.

Tavistock, Ont.

The Tavistock Rink Co. Ltd., has awarded contract for skating rink and assembly hall at Agricultural Park, to Zimmerman Bros Ltd., at $12,600.

Toronto, Ont.

The following sub-trades have been let in connection with the completion of the North Toronto Collegiate, by the Board of Education: masonry, $2,641, H. Lucas & Son, 141 Havelock St.; carpentry, $10,009, Fred Wilson, 22 Bank St.; ornamental iron, $1,964, Art Wire & Iron Co., 3 Carlaw; steel, $2,135, Reid & Brown Structural Steel & Iron Works Ltd., 63 Esplanade E.; plastering, $3,787, A. Petrie, 457 Roxton Rd.; heating & plumbing $2,799, Bennett & Wright Co., 72 Queen E.; electrical $1,290, Patterson Electric Co., 615 Yonge.

J. H. Bartlett, 84 Barrington Ave., has been awarded the general contract for the erection of a parish hall on the corner of Swanwick & Kimberley Avenues, for St. Saviour's Parish, to cost $12,000.

Truro,, N. S.

Messrs. W. R. & D. C. McKenzie, New Glasgow, N. S., have been awarded the general contract for girls' home for the Maritime Home for Girls here, at $36,150. Frank Dexter & Co., Truro, have the contract for heating and plumbing, at $8,800. Architect, E. D. Vernon, Truro.

Winnipeg, Man.

The general contract for an addition to the Nurses' Home on Bannatyne Ave., for the Winnipeg General Hospital has been let to Hazelton & Walin, Ltd., 609 Electric Railway Chambers. Architects, Northwood & Carey, 617 Union Bank Bldg., Winnipeg.

Business Buildings and Industrial Plants

Birchcliffe, Ont.

Sammon & Company, 1288 Kingston Rd., are building 2 stores, 40 x 40, on Kingston Rd. near Valhall Blvd., and will let the electric, plastering, painting, plumbing and heating trades.

Ford, Ont.

G. J. P. Jacques, 3 Ouellette Ave., is preparing plans for a $45,000 bank building at Charles St. and Drouillard Rd., for the Provincial Bank of Canada, H. O. 7 Place D'Armes, Montreal. Contract will be let shortly by the Montreal office.

Limoilou, P. Q.

Octave Flageol, 3rd Ave., is building a store and residence on 3rd Ave., to cost $15,000. Work is being done by day labor.

London, Ont.

Boxboard Products Ltd., 318 Rectory St., are contemplating the building of a 1-storey, 50 x 80 ft. addition to their plant, for the manufacture of egg cases.

Montreal, P. Q.

Tenders are being received by the general contractors, Bannell Bros., 341 Guy St., for the roofing, electric, plumbing, heating, plastering, painting, glazing and millwork contracts in connection with $25,000 molasses distillery being built at 1706 Notre Dame St. E., for the Commercial Alcohol Co.

W. Patterson, 11a St. James St., is having plans prepared for store and manufacturing flats to be built on St. Viateur St. Alcide Chausse, 70 St. James St., is the architect.

The roofing, brickwork, ornamental iron and painting contracts, also contract for installation of 2 elevators and dumb waiter will be let in connection with $100,000 warehouse building being erected on Craig St., for A. Prudhomme & Fils, Ltd., 10 de Bresoles St. Architect, E. A. Doucet, 195 St. Catherine St. E. and general contract, Art. Leduc, 352 Christophe Colomb St.

Nap. Clement, 336 Prudhomme St., is building a two-storey store and flat building, 30 x 50 ft., of frame and brick construction on Sherbrooke St.

Regina, Sask

Tenders are wanted by the architects, Reilly, Dawson & Reilly, Westman chambers, for stores on Hamilton Street, for the Nay & James Syndicate. Plans and specifications with the architects.

Timmins, Ont.

The Vipond Consolidated Gold Mines, Ltd., are increasing the capacity of their mill here from 75 to 100 ton. The work is being done by day labor, under the supervision of A Rorfman.

Toronto, Ont.

J. Sercombe, 1429 Yonge St., will shortly commence the construction of a brick garage building, 2 storeys, 55 x 100 ft., on Yonge St., near Mt. Pleasant Cemetery.

Vancouver, B. C.

Start will be made soon on alterations to market building of the Can-Van Market Co., at 27-31 Hastings St., Vancouver, to cost $22,000. Architect, J. E. Parr, 505 Carter-Cotton Bldg., Vancouver.

Victoria, B. C.

Tenders are being received by the architect, F. M. Rattenbery, 1701 Beach Drive, Victoria, (no closing date set) for the construction of marine terminal building for the C.P.R., on Belleville St., Victoria. The building will be 4 storeys of stone construction and is estimated to cost $200,000.

Winnipeg, Man.

The Lake of the Woods Milling Co. Ltd., 212 McDermot Ave., Winnipeg, will shortly commence construction of four elevators, to cost $10,000 each, at Semans, Naicam, Melfort and Rosthern, Sask. Work to be done by day labor.

CONTRACTS AWARDED

Ford, Ont.

Jno. V. Gray Construction Co., Bartlet Bldg., Windsor, have been awarded the general contract for coal bunker buildings here for the Ford Motor Car Co. of Canada, Ltd. This will be a 4-storey building with tower of brick and reinforced concrete construction.

Jno. V. Gray Construction Co., Bartlet Bldg., Windsor, have just been awarded the general contract for the construction of by-products building here for the Ford Motor Car Co. of Canada, Ltd.

Hamilton, Ont.

James McNeil, 185 Hess St. S., has the contract for alterations to building at 52 James St. N., for R. H. McKay, 108 Herkimer St., costing $10,000.

Pigott-Healy Construction Co., 36 James St. S., have the general contract for the $350,000 Lister Building and tenders are also in on the sub-trades which will be let shortly by the architect, B. H. Prack, Bay St., Toronto.

The following sub-trades were let recently in connection with the $200,000 pattern storage building on Aberdeen W., for the Canadian Westinghouse Co.: heating, Adam Clark, 7 Main St. W.; plumbing, Robert Fitzsimmons Co. Ltd., 21 Rebecca St., The general contractors are the Yates Construction Co. Ltd., 17 Main St., E.

Kitchener, Ont.

J. Messner, New Hamburg, Ont., has let the following contracts in connection with brass factory he is building here: General contractor, C. L. Forler, R. R. No. 2 Baden; excavation, E. Eickler; masonry, H. Schultz; heating, G. Steines, and plastering, J. Ruehl, all of New Hamburg, Ont.

The heating contract in connection with $40,000 car barns being built by Ball Bros., on King St. E., for the Kitchener Light Commission, 169 King St. W., has been awarded to Wm. Knell Company, King St. W., and the contract for tile to the National Fireproofing Co. of Canada, Ltd., Dominion Bank Bldg., Toronto.

London, Ont.

Mitges Bros., 298 Egerton St., have awarded the general contract for a pool room costing $15,000 to Hyatt Bros., 288 Egerton St. Architect, Walter Stuart Pavey, 380 Richmond St.

London, Ont.

The general contract for $15,000 store and apartment building on the corner of Wharncliffe Rd. and Elmwood Ave., for H. Collier, R R. No. 1, London, has been awarded to J. A. Vanderland, 1023 King St.

Midland, Ont.

The Fegles Construction Co., Fort William, Ont., have the contracts for an addition to grain elevator at Midland, for the C. N. Railways. The addition will have a storage capacity of 2,220,500 bus. and will be of reinforced concrete construction. Gen. Mgr. of elevators and warehouses for the C. N. R. C. J. Smith, Montreal.

Montreal, P. Q.

Messrs. Church & Ross, 10 Cathcart St., have just commenced work on repairs to the factory of the Dominion Oilcloth & Linoleum Co., on Notre Dame St. E.

O. Archambault, 610 Lafontaine Park, has been awarded the general contract for the erection of a 10 storey office building on Bleury St., between Ontario and Sherbrooke Sts., for Caron Freres, 233 Bleury St. J. W. Harris Co. Ltd., 120 Saguinet St., has been awarded the contract for excavating The building will be of concrete construction. General contractor undecided what subtrades will be let.

The following contracts have been let in connection with the $1,500,000 addition to the store and heating plant of the Henry Morgan Company, on St. Catherine St.: roofing, G. W. Reed & Co., 37 St. Antoine St.; electric work, Canadian Comstock Co. Ltd., 10 Cathcart St. The plastering is being done by day labor.

Steelwork is up to the 6th storey of the new 10-storey, $3,000,000 office Building for the Insurance Exchange Corp. Ltd., and the following contracts were let recently: boilers ,Plant Machinery Ltd., 1790 St. James St. W.; heating, Garth Co. Ltd., 28 Craig St.; stairs, Vulcan Steel & Iron Works, 1698 St. Denis St. General contractors are Anglin-Norcross, Ltd., 65 Victoria Sq.

In connection with the $500,000 office and warehouse structure being built on Ontario St. E., by the Federal Construction Co. Ltd., 329 Ontario St. E., the following contracts have been let: reinforcing steel, Peck Rolling Mills Ltd., 63 Mill St., Canadian Tube & Steel Propucts Ltd., 107 Hamilton St., and the Steel Company of Canada, 1272 Notre Dame St. W.; vault doors, Ahern Safe Co. Ltd., 390 St. James St. and J & L. Taylor Ltd., 220 Notre Dame St. W. The roofing, plumbing, heating, art stone, brickwork, fire escapes and sprinkler system contracts are to be let. 7-storeys, 157 x 90 ft.

New Toronto, Ont.

Phinnemore Painting Co. Ltd., 367 Dupont St., Toronto, have the painting and glazing contract for the $125,000 addition to the factory building here of R. N. Boxer Co. Ltd., Foy Bldg., Toronto.

Oakville, Ont.

H. C. Lefroy Engineering Co., 11 Leader Lane, Toronto, has the contract for reinforcing steel, and Roelofson Elevator Works, Galt, Ont., the contract for freight elevator, for the $30,000 factory building on Dundas St., Oakville, being erected by the Frid Construction Co., of Hamilton, for the Oakville Basket Factory Co. The electric, plastering and painting contracts will be let by the general contractor and the plumbing and heating contract by the owner.

Oshawa, Ont.

The following sub-trades have been let for the new assembly building and shipping shed of the General Motors at Oshawa: steel, McGregor & McIntyre, 1139 Shaw St., Toronto; roofing and sheet metal, W. S. Moffatt Co., 86 Don Esplanade, Toronto; glass and glazing, Pilkington Bros., 19 Mercer St., Toronto.

Ottawa, Ont.

The plastering contract in connection with $150,000 office building on Sparks St., for The Sparks Estate, 193 Sparks St., will probably be let to Murphy & Morrow, Billings Bridge. Architect, J. Albert Ewart, Jackson Bldg., Bank St.

H. Dagenais, 158 St. Patrick St., has

[illegible]

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders Wanted

Tenders for the construction of a reinforced [illegible] bridge over the river Speed in the Town of Preston will be received by the undersigned [illegible]

Saturday, August 4th, 1923,

Plans and specifications may be seen at the Town Clerk's office where tender forms will be supplied.

The lowest or any tender not necessarily accepted.

GEO. WURSTER, Town Clerk,
30 Preston, Ontario.

TENDERS
for School Extension

Sealed tenders for an 8-room addition to the Central School, Woodstock, Ontario, will be received by S. Nethercott, Secretary of the Board of Education, up to 12 o'clock noon,

August 2nd, 1923,

A marked cheque for 3% of the contract must accompany each tender. Deposit of $10.00 by cash or cheque returnable, will be required on each set of plans.

Lowest or any tender not necessarily accepted.

Plans and specifications may be seen at the office of the architect,

J. H. GRENFELL,
30 Woodstock, Ont.

Sealed tenders addressed to the undersigned, and endorsed "Tender for reconstruction of east pier superstructure at Cobourg, Ont," will be received at this office until 12 o'clock noon, (daylight saving),

Thursday Aug. 2nd, 1923,

for the reconstruction of 170 lineal feet of the superstructure of the east pier at Cobourg, Northumberland County, Ont.

Plans and forms of contract can be seen and specification and forms of tender obtained at this Department, at the offices of the District Engineers, Equity Building, Toronto, Ont.; Royal Bank Building, London, Ont., and at the Post Office, Cobourg, Ont.

Tenders will not be considered unless made on printed forms supplied by the Department and in accordance with conditions contained therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p.c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

Note—Blue prints can be obtained at this Department by depositing an accepted bank cheque for the sum of $20.00, payable to the order of the Minister of Public Works, which will be returned if the intending bidder submit a regular bid.

By order
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, July 10, 1923. 29-30

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Tenders Wanted

Tenders will be received by Secretary not later than

August 4th, 1923,

for installation of Direct Steam Heating System for Vineland Public School. Tenders to specify size and type of boiler to be supplied.

For full particulars, apply to Fred Cook, Vineland, Ontario, Secretary for the School Board.

The lowest or any tender not necessarily accepted. 30

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 9, Section G, subsection (a)" will be received by the undersigned until, eleven a.m. standard time on

Wednesday, August 8th, 1923,

for the excavation of approximately 47,250 cubic yards of earth and other work required in the construction of Provincial highway Yorkton North, extending from the north-east corner of Section 23, township 26, to north-east corner of Section 35, township 27, both in range 4, West of the 2nd Meridian, 8 miles.

Copies of plans, profiles and specifications may be seen at the office of the undersigned and at the office of each of the following parties:-

Wm. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.; E. B. Webster, Yorkton, Sask.

An accepted cheque for the sum of $700.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of three p.m. standard time, on Wednesday, August 8th, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways,
Department of Highways, Regina, Sask.
July 18th, 1923. 30

City of Lethbridge

Tenders for Street Paving and Sidewalks

Sealed tenders marked "Tenders for Street Paving" and "Tenders for Sidewalks" will be received by the undersigned up until noon

July 31st,

for the construction of approximately 9000 square yards of Cement Concrete Street Paving and 700 square yards of Cement Concrete Sidewalks.

Plans and specifications may be seen at the office of the commissioner of Public Works.

The lowest or any tender not necessarily accepted.

DONALD A. DUFF,
City Clerk,
29-30 Lethbridge, Alta.

Tenders for Improvement of Road

Pursuant to the requirements of The Canada Highways Act, sealed tenders marked "Tenders for Project 34, Section B, subsection (a)" will be received by the undersigned until, eleven a.m. standard time on

Wednesday, August 1st, 1923,

for the excavation of approximately 34,000 cubic yards of earth and other work required in the construction of Provincial highway from Bengough South, 8½ miles.

Copies of plans, profiles and specifications may be seen at the office of the undersigned and at the office of each of the following parties:-

Wm. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.; W. C. Williams, Sec-Treas. R.M. No. 40, Bengough, Sask.

An accepted cheque for the sum of $700.00 payable to the Deputy Minister of Highways, or a Guarantee Company's bid bond, must accompany each tender.

The right to reject any or all tenders or to waive any defects or irregularities therein is to be at the discretion of the Minister of Highways. Tenders will be opened in public in the office of the Deputy Minister at the hour of three p.m. standard time, on Wednesday, August 1st, 1923.

The unauthorized insertion of this advertisement will not be paid for.

H. S. CARPENTER,
Deputy Minister of Highways,
Department of Highways, Regina, Sask.
July 18th, 1923. 30

TOWN OF WESTON

Tenders for Sewers

Sealed tenders, clearly marked on the outside as to contents, will be received by the Town Clerk of Weston, for supplying and laying approximately 7000' of sanitary sewers in the south-easterly section of the Town. Tenders close at noon,

Tuesday, July 31, 1923,

Plans and specifications may be seen at the office of the Consulting Engineers, James, Proctor & Redfern, Limited, 36 Toronto Street, Toronto, or at the office of Mr. H. L. Seymour, Municipal Engineer, Weston, Ontario.

A. G. PIERSON, R. J. FLYNN,
Acting Clerk. Mayor.
30

Tender for Concrete Piers and Abutments

County of Kent

Sealed tenders will be received by the undersigned up till noon on

Friday, August 10th, 1923,

for the construction of Two Concrete Abutments and two concrete piers for the proposed bridge over the River Thames near Prairie Siding Station on the Canadian National Railway.

The work involves the placing of about 1150 cubic yards of concrete and the driving of about 250 piles, in addition to sheet piling and other work.

Plans and specifications and forms of Tender and contract may be seen at the office of the undersigned, Chatham, Ontario.

Tenders must be accompanied by marked cheques for at least 5% of the amounts of the Tenders.

The lowest or any Tender not necessarily accepted.

W. G. McGEORGE, C.E.
30-31-32 Chatham, Ontario.

Sealed tenders addressed to the undersigned and endorsed "Tender for White River Bridge" Hilliardton, Ont., will be received until 12 o'clock noon.

Tuesday, July 31st, 1923,

for the construction of the substructure, and erection of the steel superstructure supplied by the Department, F. O. B. Earlton, Ontario, of a bridge across the White River at Hilliardton, Ont.

Plans and Specifications can be seen and forms of tender obtained at the office of the Chief Engineer, Department of Public Works, Ontario, Parliament Buildings, Toronto, and of Public Works Foreman, D. H. McIntosh, New Liskeard, Ont.

Tenders will not be considered unless made on the forms supplied by the Department and in accordance with the conditions set forth therein.

Each tender must be accompanied by an accepted cheque payable to the order of the Minister of Public Works, Ontario, equal to 10% of the amount of the tender.

The Department reserves the right to reject any or all tenders received.

H. F. McNAUGHTEN,
Secretary.
Department of Public Works, Ontario.
Toronto, July 17th, 1923. 29-30

TOWN OF THOROLD

Tenders for Sidewalks

Sealed tenders marked, "Tender for Sidewalks", and addressed to D. J. C. Munro, Town Clerk, Thorold, Ontario, will be received until 5 o'clock p.m.

Tuesday, August 7, 1923,

for the construction of approximately 45000 sq. feet of sidewalks.

Plans and specifications may be seen and forms of tender obtained from the Engineer.

No tender necessarily accepted.

F. N. RUTHERFORD, Town Engineer,
24 Queen Street,
30-31 St. Catharines, Ont.

TOWN OF TIMMINS

TENDERS

Watermains and Sanitary Sewers

Sealed tenders will be received up to 5 P.M. August 1st, 1923 for the construction of approximately

10,000 lineal feet of 6 inch Watermain.
8,000 lineal feet 8 and 10 inch Sanitary sewer.

Plans and specifications may be seen at Office of Town Engineer. Address all Tenders to the Town Clerk.

Lowest or any tender not necessarily accepted.

C. R. MURDOCK, H. E. MONTGOMERY
Town Engineer Town Clerk.
30

Tenders Wanted

Board of Education

Sealed tenders, addressed to the Business Administrator and Secretary-Treasurer, Board of Education, Administration Building, 155 College St., endorsed with the word "Tender" and also with the name of the school building and trade or article to which it relates, will be received until

Thursday, July 26, 1923,

for

(1) **Masonry, Structural Steel, Carpentry, Plastering, Ornamental Iron, Roofing and Tinsmithing, Plumbing and Heating, Wiring, Local Phones for KEW BEACH SCHOOL.**
(2) **Fibre Mastic Flooring for LESLIE GARDENS SCHOOL.**
(3) **Fibre Mastic Flooring for HUMBERSIDE COLLEGIATE.**

Specifications and conditions of tendering may be seen and all information obtained at the office of the Architect of the Board, 155 College St., Telephone Trinity 8200.

Tenders must be in the office of the Secretarial Department at the Adminstration Building, 155 College St., **not later than 4 P.M. on the day named,** after which no tender will be received. The lowest or any tender will not necessarily be accepted.

H. L. KERR, W. W. PEARSE
Chairman Property Business Administrator
Committee Pro Tem & Secretary Treasurer
30

TO CONTRACTORS

Sealed tenders, marked "Tenders for Court House, Port Arthur," addressed to the undersigned, will be received at this Department until

Thursday, the 2nd day of August

for all works in connection with the erection of a Court House at Port Arthur, Ontario, with the exception of Heating, Plumbing and Electric Wiring. Plans and specifications may be seen at the office of Messrs. C. D. Howe and Co., Consulting Engineers, Port Arthur, and at this Department. Each tender must be accompanied by an accepted bank cheque payable to the Honorable George S. Henry, Minister of Public Works and Highways, Ontario, for five per cent. of the tender, and the bona fide signatures and addresses of two sureties, or the name of a Guarantee Company, approved by the Department, willing to provide a bond for the due fulfilment of the contract. The Department is not bound to accept the lowest or any tender.

By order.
H. F. McNAUGHTEN,
Secretary Public Works
Department, Ontario.
Toronto, July 17th, 1923.

Newspapers publishing this without authority will not be paid for it. 30

Tenders for Dredging

Sealed tenders addressed to the undersigned and endorsed "Tender for dredging, Whitby," etc., as the case may be, will be received until 12 o'clock noon (daylight saving),

Monday, July 30, 1923,

for dredging required at Whitby, Cobourg, Toronto, Tiffin and Mitchell's Bay, Ontario.

Tenders will not be considered unless made on forms supplied by the Department and according to conditions set forth therein.

Combined specification and form of tender can be obtained on application to the undersigned, also at the offices of the District Engineers, Equity Building, Toronto, Ont., and Royal Bank Building, London, Ontario. Tenders must include the towing of the plant to and from the work.

The dredges and other plant which are intended to be used on the work shall have been duly registered in Canada at the time of the filing of the tender with the Department, or shall have been built in Canada after the filing of the tender.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, for 5 p. c. of the contract price, but no cheque to be for less than fifteen hundred dollars. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, July 20, 1923. 30

For Sale

1 Sawyer Massey Road Grader.
1 50 ton bin and screen, with elevator and buckets.
1 London paver.

Box 291, Contract Record, Toronto. 30 t.f.

Hydro Electric Power Commission of Ontario

Tender for Bridge Substructure

Sealed tenders marked "Tenders for Victoria Street Bridge Substructure" addressed to Sir Adam Beck, Chairman, Hydro Electric Power Commission of Ontario, 190 University Avenue, Toronto, will be received until noon,

August 3rd, 1923,

for the construction of the concrete substructure and reinforced concrete deck of a bridge across the Commission's Power Canal at Victoria Street, [illegible]

Plans, specifications forms of tender and other information may be seen on application at the office of T. U. Fairlie, Railway Engineer, Cor. Centre Ave., and Elm Street, Toronto.

W. W. POPE,
Secretary.

Toronto, July 24th, 1923. 30

Contractor with grading and highway equipment for 25 teams open for sub contract for balance of season anywhere in Ontario. Write for particulars to Box 319, Contract Record, Toronto. 29-30

For Sale

Half million hard wire cut face or backing brick, for immediate delivery. Box 323, Contract Record, Toronto. 30-31-32

For Sale

Fireproof vault doors in good condition, apply Box 304, Contract Record, Toronto. 28-31

For Sale—Cheap

1—6 ft. Wettlaufer Mixer on trucks with side loader and gasoline engine. Overhauled and painted and in good running condition. K. W. Lewis, 105 Front St. East, Toronto, Ont. 28 T.f.

Sash and Door Factory For Sale

as going concern in thriving city. Bargain. Terms. Apply J. Bone, P.O. Box 401, Belleville, Ont. 30

Dump Cars

We have 16 V shaped Steel dump cars in first class condition for sale cheap. Patterson Construction Co. Ltd., Belleville, Ont. 30

STEEL PILING

Bought and Sold

Universal Equipment Company

[illegible] Niagara Falls

Architects

My boy finished school this term with honor card. Anxious for a position in an architect's office, Montreal; willing to make himself useful; knows city well. W. J. Large, Painter and Decorating Contractor, 2492 Mance Street, Montreal, P.Q. 30

To Architects

An examination for admission as associate R.I.B.A., will be held in Toronto in December 1923. Those intending to sit for this examination should forward their applications to England before August 31st., 1923, upon forms which may be obtained from

F. S. BAKER,
Hon. Secretary R.I.B.A. for Canada,
29-30 67 Yonge St., Toronto.

Cableway and Plant for Sale or Rent

One cable-way and plant, complete, consisting of:

1—40 H.P. Locomotive Type Boiler.
1—Pair of cable-way engines, 9 x 12.
2—A Frames and 8 sheaves. Wire, Rope, carriage, etc.

We also have stiff-leg derricks.

1—36" Symonds Disc Crusher.
2—No. 4 Jenckes and 1 No. 3 McCully Gyratory Crushers.

And other miscellaneous equipment.

JAFFE MACHINERY EXCHANGE,
53 Montfort St., Montreal.
Main 8398. 30-31

WANTED TO RENT—Crushed Plant complete with Tractor Bins, etc., also Road Roller, 3 months' work. Apply Box 334, Contract Record, Toronto. 30

Building superintendent wanted for flat slab reinforced concrete warehouse. Apply Box 324, Contract Record, Toronto. 30

Transmission line engineer wanted for location, design and construction high voltage steel tower lines. Apply Box 328, Contract Record, Toronto 30-31

Contractors' Equipment, consisting of Steel and Western Dump Cars, Small Locomotives, Steel Rails, etc., for sale. Apply Box 330, Contract Record, Toronto. 30-31

POSITION WANTED—Construction Superintendent, experienced in successful handling of difficult foundations, bridges, buildings. Engineering training—open for position with contracting firm acting as general foreman on smaller jobs. Box 336, Contract Record. ,30

Is London Crumbling?

London is said to be slowly crumbling away, or at least most of the historic buildings are decaying.

In an effort to ascertain the cause of this crumbling of apparently insoluble stonework, the government has appointed a committee of scientific experts to thoroughly probe the matter.

It is known that stone used in one part of the country will stand unaffected, but if used in another it will decay. This is a mystery the experts have to probe, and it will take considerable time, for it involves questions of chemistry, biology and physics. Among the buildings needing immediate attention are the famous Carlton Club, Tower of London, Houses of Parliament, Holyrood Castle and Tintern Abbey.

Business Buildings and Industrial Plants

CONTRACTS AWARDED

(Continued from page 53)

been awarded the general contract for altering residence on Albert St. into apartments, for Mr. Thorburn, 401 Albert St. This contract will involve an expenditure of $9,000.

Sault Ste. Marie, Ont.
Taylor Bros., Gore St., have been awarded the wiring contract in connection with the $12,000 addition to the mill of the Soo Lumber Company on North St. General contractor, McLarty Bros., 38 Wellington St. E.

Thetford Mines, P. Q.
The following additional trades have been let in connection with the $500,000 asbestos mill being built by the Asbestos Corporation, Canada Cement Bldg., Montreal: electrical work, Canadian Comstock Co. Ltd., 10 Cathcart St., Montreal; ornamental iron, Montreal Ornamental Iron Works.

Tillsonburg, Ont.
Mr. Stephen Scott is erecting a factory at Tillsonburg, Ont., or the Norolk Shoe Co.

Toronto, Ont.
The Empire Clothing Manufacturing Co., 160 John St., have awarded the contract for a 7-storey manufacturing building, on the northeast corner of Spadina Ave. and Phoebe St., to L. E. Dowling, 167 Yong St. The building will be of mill and brick construction, 44 x 122 ft., and will cost about $100,000. Architect, Benjamin Brown, 287 Spadina Ave.

Angus Gillies, 548 Dovercourt Rd., has the general contract for the erection of store and apartment building to cost $9,000, on Eglinton Ave. W., for R. MacLelland, c/o general contractor. Tenders are wanted on the steel, roofing, electric, plastering, painting, plumbing and heating trades.

Winnipeg, Man.
Contract for masonry and concrete work in connection with 7 stores, on Portage and Beverley streets, for Jos., McGreevy, has been let to J. Reid, corner Beverley & Sargent Sts, Winnipeg; sheet metal, ventilating and heating to MacDonald Bros. Sheet Metal & Roofing Co. Ltd., 51 Aikins St.; Plumbing, C. D. Kirk & Co., Tribune Bldg.; plastering, J. Malcolm, c/o the general contractor, Wm. Page & Co., 334½ Smith St. The owner's address is also c/o the general contractor.

Woodstock, Ont.
Chas Lampman, 73 Wilson St., has the general contract for addition to business block at 375 Dundas St., for Dr. Melford and Dr. Drupp, Cor. Dundas and Light Sts., at $7,000. Harvey & Wilson, 7 Light St., have the plumbing and heating contract

Residences

Barrie, Ont.
The Ball Planing Mill Co. are building a residence for Mr. Wm. Johnston here.

Chatham, Ont.
S. Thompson, Fifth St., is building a $6,000 residence on Stanley Ave. Mr.

W. Lewis, 36 Lowe St., has the general contract; D. McMillan, 67 Bedford St., the contract for excavating and George Garson, King St., the contract for plumbing.

Halifax, N. S.

W. B. Moriarty, 71 Wellington St., is building a residence on Wellington St. and will let sub trades. Architect, D. F. Saxton, Bermingham St.

Hamilton, Ont.

Geo. Johnson, 14 Houghton Ave., has just commenced work on a residence to cost $6,000 on Rothsay Ave.

H. H. Turner, 68 Harvey Ave., contemplates the construction of 6 residences on Fairfield Ave., at a total cost of $18,000.

Harriston, Ont.

Messrs. Murphy & Walker are having plans prepared for three brick residences to be built on William St., to cost $12,000.

Montreal, P. Q.

S. Perron, 1684 Papineau Ave., is building an $8,000 residence on Bordeau St. and will sub-let the masonry, roofing, electric, plumbing and plastering trades.

The Senneville Development Co. Ltd., 390 Cote des Neiges Rd., will shortly commence construction of 28 residences on Redpath Ave., between Sherbrooke and Pine Ave., at a total cost in the neighborhood of $150,000. Sub-trades will be let.

J. E. A. Benoit, 1200 Wellington St., is preparing plans for 5 flats in Point St. for Charles Ward, for which tenders will be called about the end of next month.

A. Beaudry, 1722 De La Roche St., is building an $8,000 residence on Beaubien St. General contractor, A. S. Trudel, 1792 De La Roche St., will let sub-trades.

T. Laframboise, 2930 St. Laurent St., is building $8,000 residence on St. Denis St. and wants tenders at once on the following sub-trades: roofing, electric, plumbing, heating, plastering and brickwork.

Jos. Malo, 159 Dufresne, is having plans prepared for 12 flats on Frontenac St. Architect, R. Charbonneau, 194 G. E. Cartier Sq.

E. Grondine, 1233 Des Erable St., is building an $8,000 residence on Bordeau St., and will sub-let the masonry, roofing, electric, plumbing, heating, plastering and painting trades.

The Wm. Penk Home Bldg. Cl. Ltd., 192, 9th Ave. W., is building four residences on this street, to cost $7,000 each. Work is being done by day labor.

The roofing, electric, plumbing, heating, plastering, brickwork and millwork contracts in connection with $10,000 cottage being erected on Wilder, near Van Horne, by E. Cadieux, 1118 Ste. Antoine, will be let. Architect, F. Charbonneau, 194 G. E. Cartier Square.

G. L. Langlois, 1758 Delorimier St., is building a $7,000 residence on Delorimier St. and will sublet the masonry, roofing, electric, plumbing, heating and plastering trades.

J. Lebeau, 1014 Henri Julien St., is building a large residence on Mayfair St. and will probably sub-let roofing, plumbing, electric, heating, plastering, brickwork and tiling contracts.

The masonry, roofing, electrical, plumbing, plastering and painting contracts in connection with 2 residences on 5th Ave., costing $16,000, will be let by the owner and builder, Mr. N. Beauchamp, 1559 Bordeaux St.

T. Bellehumuir, 1235 Parthenais St., is building a residence on Davidson St., for O. Gourre, 178 Lariviere, costing $6,000. Sub-trades to be let.

F. Lavigne, 566 Boulevard Bernard, is building a $6,000 residence on this street. Work will probably be done by day labor.

The roofing, electric, plumbing, plastering and painting trades are to be let in connection with 3 residences under construction on Mount Royal and Messier Sts., by N. Beauchamp, 1559 Bordeaux St.

The masonry, roofing, electric, plumbing, heating, plastering and painting contracts will be let in connection with 2 residences on Marie Anne St., being built by A. Lachayselle, 1281 Marie Anne St., at a cost of $16,000.

Ottawa, Ont.

Tenders are being received until July 30 by David Arbuckle, 215 Argyle Ave., for electric, plumbing, heating and plastering trades in connection with $9,000 residence he is building on Clemow Ave.

Tenders are being received by Rostetter & Taylor, Belmont Ave., on the electric, plumbing, heating and plastering trades in connection with $6,000 residence he is building on Powell Ave

Cales Brooks, 590 Driveway, is building a $7,000 residence on Broadway Ave. and will require materials.

Outremont, P. Q.

Raoul Moiseux, 599 Note Dame W., is building an $19,000 cottage on McCulloch St. and wants tenders on electric, plastering, painting, marble and tile trades. Architect, C. Dufort, 195 St. Catherine St. E.

S. Frappier, architect, 2238 Park Ave., is preparing plans for 3 cotages to be built here.

S. Frappier, 2238 Park Ave., is preparing plans for a 6-family residence here.

Point Grey, B. C.

Construction is to start at once on $10,000 residence at 1326 Laurier Ave., or C. J. Phillips, 2654 7th Ave. Architect, R. W. S. Chadney, 710 Northwest Bldg., Vancouver.

W. A. Locan, 973 Broadway W., Pt. Grey, is building $8,000 residence. Sub-trades not let.

Ste. Anne de la Perade, P. Q.

Mr. A. L. Desaulniers contemplates the erection of a $12,000 cottage here, of two storeys, 36 x 38 ft.

St. John, N. B.

W. J. Fenton Land & Building Company, Princess St., is building 5 residences on Douglas Ave., each 2 storeys, 48 x 31 ft., at a total cost of $40,000.

Toronto, Ont.

A. Nelson, 7 Evans Ave., is building 2 residences costing $7,500 each on Willard Ave.

Roy D. Shan on, 123 Glenrose Ave., will let the electric, plumbing, heating, plastering and painting trades in connection with $7,000 residence and garage he is erecting at 121 Glenrose Ave.

Bryan B. Kennedy, 75 Wells Hill Rd., is building 2 residences on Glencairn Ave., costing $6,500 each, and will let the painting, plastering, heating, plumbing and electric trades.

Wm. G. Burns, Port Credit P.O., is building 5 duplex residences on Parkside Drive, at an estimated cost of $40,000. Tenders are wanted on the painting, plumbing, heating, electric and plastering trades.

The plastering, painting, electric, plumbing and heating trades will be let in connection with $10,000 residence being erected at the corner of Hillcrest Drive and Conrad St., by Mr. Hugh Munro, 592 Sherbourne St.

Messrs. Robert Bros., 241 Dovercourt Rd., want tenders on the plastering, heating, painting, electric and plumbing trades in connection with duplex residence they are building at Duplex and Cashin Rd.

J. W. Walker, 350 St. Clair W., is building a duplex residence on Walmer Road, costing $13,000, and will let the painting, plastering, heating, plumbing and electric trades.

Robt. Aspinwall, 310 Oakwood Ave., is building 2 residences on Oriole Parkway, to cost $9,500 each and will let the electric, plumbing and heating trades.

Thos. G. Henthorne, 192 Roselawn Ave., is building 4 residences at Cranbrooke and Elm Road, valued at $6,500 each, and want tenders on painting, plumbing, plastering, heating and electrical work.

Tenders are wanted by Walter G. Hunt, 450 Balliol St., for the plastering, heating, painting, electrical and plumbing trades in connection with pair of residences he is building on Woburn Ave., costing $6,000 each.

Messrs. Ruttle & Ruttle, 1680 Gerrard St. E., will commence work at once on 2 pairs of residences on Robins Ave. The electric, plumbing and heating trades have been let.

H. C. Roberts, 241 Dovercourt Rd., is building a $7,000 residence on Baby Point Crescent.

James Ritchie, 718 Annette St., is building an $8,500 bungalow at 260 Armadale Ave. and will let the painting, plastering, plumbing, heating and electric trades.

James N. Rawlinson, 107 Boon Ave., is building a $7,500 duplex residence on Dufferin St., and will let the sub-trades.

Harry Graham, 50 Fairview Ave., has commenced work on an $8,000 residence at Ardagh and Durie Sts. Sub-trades will be let.

The painting, plumbing, plastering, heating and electric trades will be let in connection with $6,000 residence being built on Duplex Ave., for Mrs. J. Grant, 225 High Park Ave. Veale & Son, 528 Runnymede Rd., are the masonry contractors.

Sub-trades will be let in connection with two pairs of residences, costing $4,500 each, now being built at 331-337 Indian Grove, by A. O. Scott, 387 Indian Road.

Messrs. Churchill & Morrell, 699 Woodbine Ave., will shortly commence work on an $8,000 bungalow on Milverton Blvd.

Mr. D. E. Bennett, 2782 Dundas St.

[illegible] is erecting a $6,000 residence on Millwood Rd., and will sub-let the electric, plumbing, heating, plastering and painting trades.

Mr. R. W. Kerr, c/o Page & Warrington, Confederation Life Bldg., is building a residence at 4 Woodlawn Ave. J. Robert Page, 18 Toronto St., has the masonry contract and J. D. Young & Son, 835 College St., the carpentry contract. Messrs. Page and Warrington are the architects.

J. Stevens, 142 Hillsdale Ave., is building a $6,000 residence at 140 Hillsdale Ave. and will let heating, plastering, painting, electric and plumbing trades.

Verdun, P. Q.

Tenders are to be called in a week's time for the building of residence and 3 stores on Wellington St., by the architect, J. E. Benoit, 1200 Wellington St. Block to be 3 storeys, 50 x 100 ft.

Walkerville, Ont.

Messrs. Nichols & Sheppard, Dowler Bldg., Windsor, are preparing plans for a $35,000 residence and garage for C. S. King, Gas Bldg., Chatham St. W., Windsor.

Windsor, Ont.

All sub-trades will be let in connection with residence and 2 garages being built on Giles Blvd., by F. Wheelton, 1355 Dougall Ave., at a cost of $8,000.

L. D. Galloway, 357 Windermere Rd., is building an $8,000 duplex residence on Giles Blvd. and will let electric, plumbing, plastering and painting contracts.

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for Contractors, for Public Highways, Contracts and all Municipal and private Corporation work.

We keep up to date information on contracts let and tenders called.

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of Canada

FIDELITY AGENCY
OF CANADA
[illegible]

CONTRACTS AWARDED

Barrie, Ont.

The following contracts have been awarded in connection with a $7,000 residence being erected on Collier St., for H. A. Henery: excavation, Wm. Minogue; masonry, Mr. Meredith; millwork, Ball Planing Mill Co.; heating, H. Barron; plastering, Bert Partridge; painting, Mr. Harris; carpentry, Walter Patterson, Stroud, Ont.

Dundas, Ont.

Joseph E. Smith, Ancaster, Ont., has awarded contract for $7,000 residence on Victoria St., to F. D. Barnes, 23 Fife St., Hamilton.

Halifax, N. S.

Stewart Ford, 125 Preston St., has the general contract to erect a house on Henry St. for Mr. H. G. Fraser. Cost $7,000.

Hamilton, Ont.

Theo Leamington, 18 Hilda Ave., has the general contract for the erection of a $7,000 residence on Jackson St. W.

London, Ont.

The Webster Construction Co., 134 Carling St., has been awarded the general contract for the erection of 2 residences, costing $10,000, on Wharncliffe Rd., by R. H. Smith, 193 Wharncliffe Rd.

Montreal, P. Q.

The roofing, heating and plumbing contracts in connection with five residences and four garages being built on Sherbrooke St., for H. A. Caille, 1410 St. Catherine St. E., has been let to Daniel Kochenburger, 2739 St. Hubert St. General contractor E. Dussault, 99 Delanaudiere St.

Montreal, P. Q.

R. Cadieux, 56 Mount Royal Ave. E., has the plumbing contract and L. Legault, Chambord St., the plastering contract in connection with $16,000 residence being erected on Denormanville St., by Oscar Proulx, 99 St. Jacques.

The following contracts have been awarded in connection with 2 flats being erected on St. Denis St., by P. L. W. Dupre, 20 St. James St.: steel, Dominion Bridge Co. Ltd., Lachine, P. Q.; carpentry, F. A. Meunier, 2381a St. Hubert St.; sash and doors, Fiset & Dupre, Contrecoeur, P. Q. Balance of sub-trades to be let.

Ottawa, Ont.

Messrs. Cowie & Moore, 50 Craig St., have the contract to build a $9,000 residence on Linden Terrace for J. A. Brownlee, Bank St.

S. F. Smith, 438 Bay St., has been awarded the general contract for the erection of $8,000 residence on Central Terrace for P. Walker, c/o the contractor.

Outremont, P. Q.

L. Allard, 463 Rivard St., has the general contract for the erection of a $10,000 cottage on Champagneur St., for C. H. Blouin, 1048 Van Horne St. Sub-trades will be let.

O. Marquis, 713 Outremont Ave., has the general contract to build two residences on Wiseman Ave., to cost $15,000, for Mrs. A. Legault, 713 Outremont Ave. Sub-trades will be let.

Denis Construction Co., room 26, 30 St. James St., have been awarded the general contract for $10,000 residence on Elmwood Ave., for Geo. Gundy, 2080 Hutchison St. The contractor wants tenders on all sub-trades.

Selkirk Bros., 2308 Waverly St., have

MacLean Reports Cover Canada

MacLean Building Reports will give you accurate, advance information on every building and engineering contract of consequence in the Dominion.

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Subscriptions may be placed for any one city, portion of a Province or more than one Province. Rates range from $25 yearly for the smallest cities to $664.00 yearly for the entire Dominion.

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106 Winch Bldg. - - VANCOUVER

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General Manager for Canada

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Sidney W. Band
Assistant General Manager

112 St James St.
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Canadian Secretary

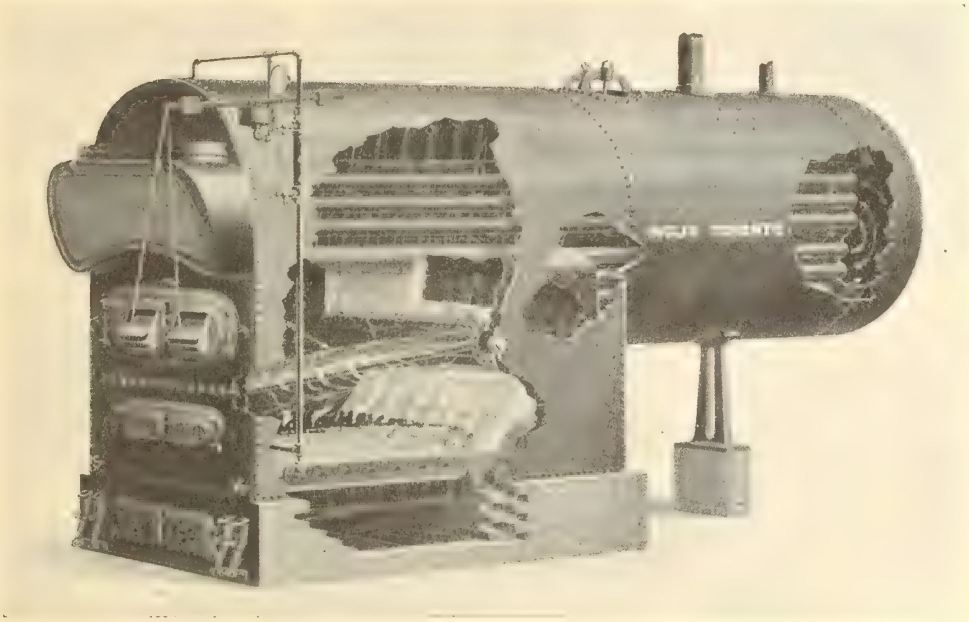
UNITED STATES FIDELITY & GUARANTY
COMPANY

THE JOHN INGLIS CO.

LIMITED

ENGINEERS AND BOILERMAKERS

ESTABLISHED 1860



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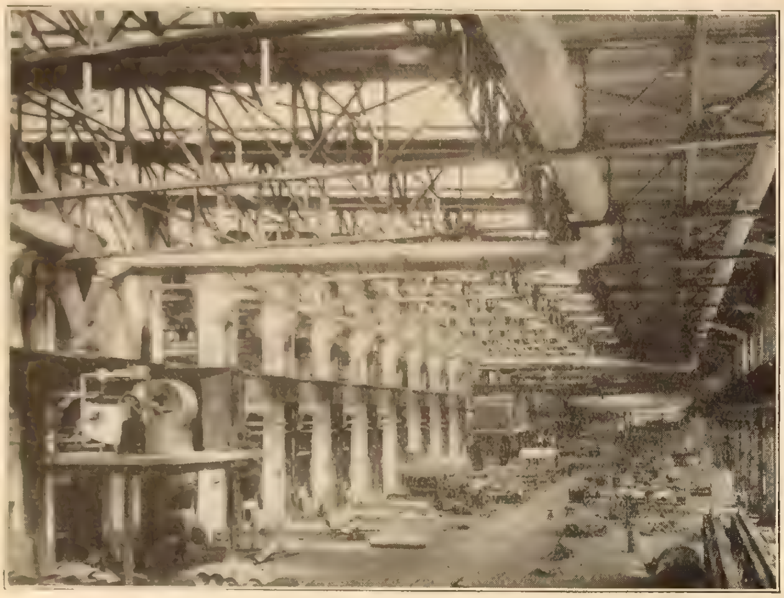

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The experience of Sturtevant engineers is at your disposal. Let them solve your heating and ventilating problems. Ask for folder 606.

B. F. Sturtevant Company
of Canada, Limited.
Montreal - Galt - Toronto

Sturtevant
PUTS AIR TO WORK

the plumbing and heating contract and Wm. Rutherford & Sons, 425 Atwater Ave., the millwork contract in connection with 2 residences, costing $16,500, being built on Dunlop St. by Cook & Leitch, 358 Beaver Hall Hill, for R. J. Bell, 159 Querbes St.

Denis Construction Co., 3820 St. Lawrence Blvd., have the contract to build a $14,000 cottage on Outremont Ave., for H. Cardinal, 180 St. James St. The contractors want tenders at once on the roofing, electric, plumbing, heating, plastering, brickwork, sash and doors, marble, tile and painting trades.

Reid Bros., 2a Tower, have been awarded the contract for the building of $24,000 cottage at Holyroad, for J. A. Yates, 759 Hartland St. Sub-trades to be let.

The following sub-trades have been let on $80,000 apartment house at the corner of Bernard and Outremont, being built for Dr. G. A. Belanger, 211 Mount Royal Ave. E.: roofing, Jos. Lamarche, 896 Drolet; architectural iron, Vulcan Steel & Iron Works, 1698 St. Denis St. H. Capra, 2795 Drolet St., will probably get the contract for marble and tile. Tenders are wanted at once on galvanized iron cornices.

Pointe du Lac, P. Q.

Jos. Lacroix, 10a St. Oliver St., Three Rivers, has been appointed general contractor on the construction of a $7,000 house for Hon. Jacques Bureau, 18 St. Joseph St., Three Rivers. Plumbing and plastering trades will be sub-let.

Toronto, Ont.

P. Balderston, 129 Spruce Hill Ave., has the contract to erect $6,000 residence on Belsize Drive, for Miss M. Williams, 90 Manor Rd. Sub-trades to be let by owner.

W. H. Binnie, 147 Westmoreland Ave., is erecting a residence on Rosedale Rd., for Miss O. Fenson, costing $8,000. Owner's address c/o general contractor. Sub-trades to be let by general contractor.

Messrs. Dawson & Chipchase, Soudan Ave., have the masonry contract in connection with a $7,000 residence being built on Garfield Ave. by G. Vaughan, 91 Garfield Ave. Heating contract will be let.

Messrs. Graham & Sibbett, 9a Wellington St. E., are the general contractors on a $6,000 residence at 29 Manor Rd., for Mr. W. R. Parkes. Sub-trades to be let by owner, whose address is c/o the general contractor.

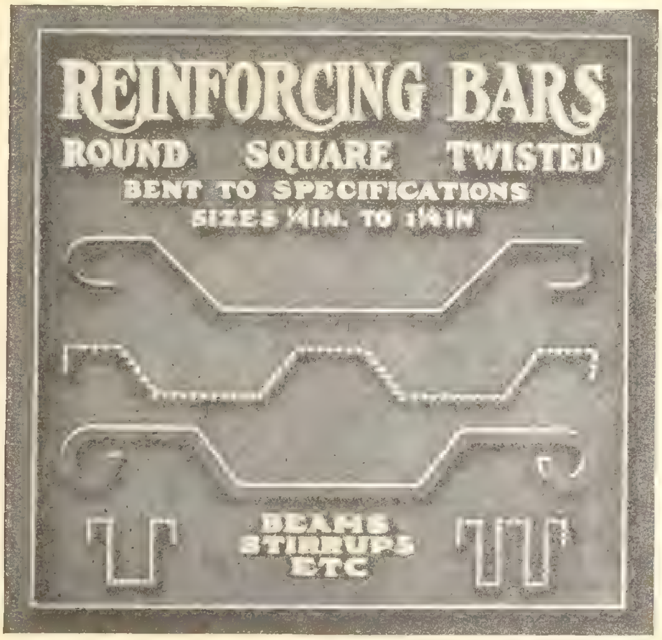
A. C. Salisbury, 669 Pave Ave., has been awarded contract for the masonry work on residence being erected at 148 Glencairn Ave. D. R. Franklin, architect, 587½ Yonge St., will let the electric, heating, plumbing, plastering and painting trades.

A $20,000 residence is being built by E. Gray, c/o the general contractor, G. W. Wilson, 33 Cashin Rd., on the south side of Douglas Ave. The following sub-trades have been let: masonry, Chas. Nobbes, 7 Whiteside Pl.; carpentry, W. Adams, 944 Dundas St. E.; painting, Bradley Bros., 197 Rushton Rd.; plumbing, R. J. Ritchie, 851 Logan Ave.

The Graham Construction Co., 10 Erskine Ave., has the contract for the erection of a $6,000 residence on the west side of Duplex Ave. Sub-trades will be let.

BURLINGTON STEEL COMPANY, LIMITED

HAMILTON CANADA



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Bending

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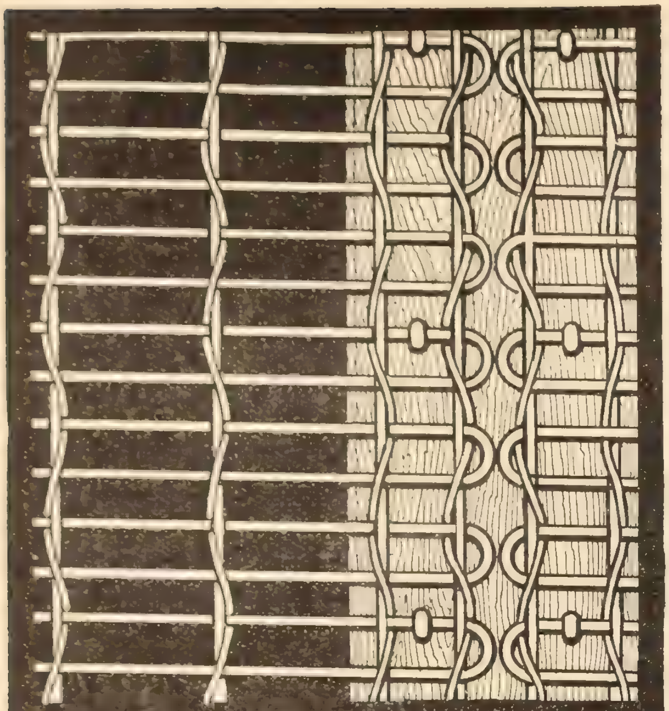

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Selvedge edge prevents cutting or scratching while handling; lathers can work faster.

"Truss" construction prevents buckling when lathe is unrolled. Lays flat. Requires no lacing at edges over studs and joists. Can be placed over sheathing without furring. The truss construction raises every other wire off the joist thus providing a perfect key to the plaster even at the joists.

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Tractors
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CANADIAN ROAD MACHINERY CO.
11 St. Lawrence Blvd. MONTREAL

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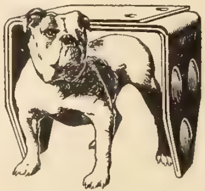

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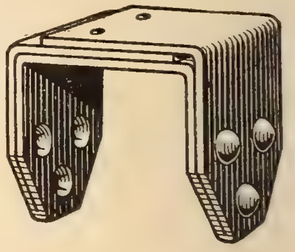

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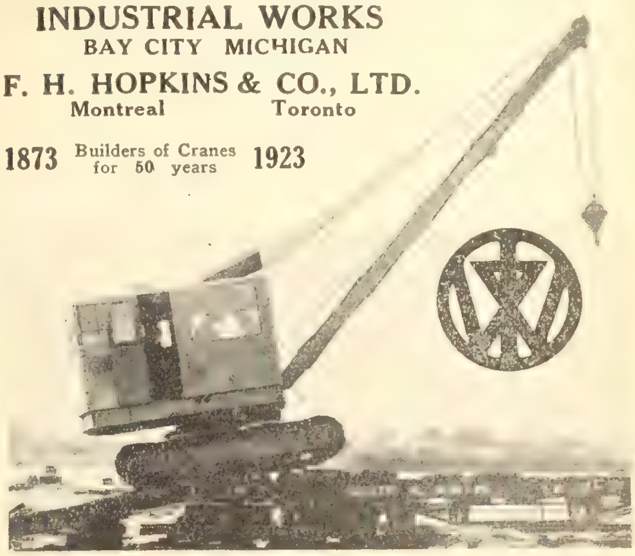
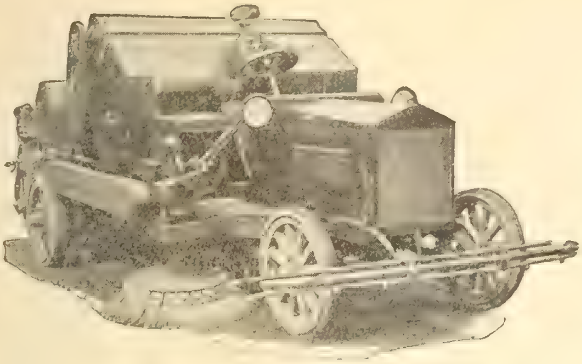


Your city is judged by its streets



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St. John Quebec Montreal Ottawa Toronto Windsor Winnipeg Regina
Calgary Vancouver Victoria

148

Current Prices of Building and Engineering Materials

		Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.45
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	10.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	25.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*†	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	25.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	65.00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00**	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base	4.00 base	4.60	[illegible].00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.00 "	5.10 base	
Hoops	per 100 lbs.	5.00 "	3.75 "		
Twisted and deformed bars	per 100 lbs.	3.90 "	4.00 "	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	4.00 "	4.00 "	5.35	6.00
Structural shapes	per 100 lbs.	3.90 "	4.25 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.15	6.25
Plates—3/16 in.	per 100 lbs.	4.40 "	4.25 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.50 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.50 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
Cast iron pipe	per ton	65.00 "	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.45	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.

LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.80.

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STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.

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Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	94.50	65.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	45.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	135.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	145.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.25	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	70.00

PAINTS, OILS, COLOURS (delivered):—		Toronto	Montreal	Winnipeg	Vancouver
White lead ground in oil, less than ton lots	per cwt.	15.00	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	14.50
Putty in bulk	per cwt.	5.95	4.25	5.50	6.50
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.38	1.40	1.26	1.56
Raw linseed oil, in bbls.	per gal.	1.35	1.38	1.23	1.53
Turpentine, in bbls.	per gal.	1.60	2.20	2.50	2.80
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45

PLASTER (Delivered):—		Toronto	Montreal	Winnipeg	Vancouver
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	26.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50

LABOR:—		Toronto	Montreal	Winnipeg	Vancouver
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.25	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers (Common)	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Laborers (Skilled)	per hr.	.60- 70			.90
Sheet Metal Workers	per hr.	.80			

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

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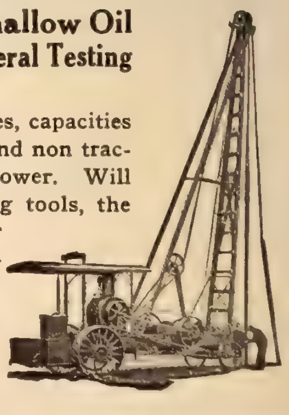

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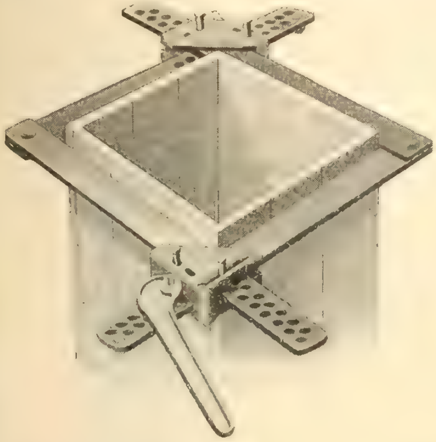

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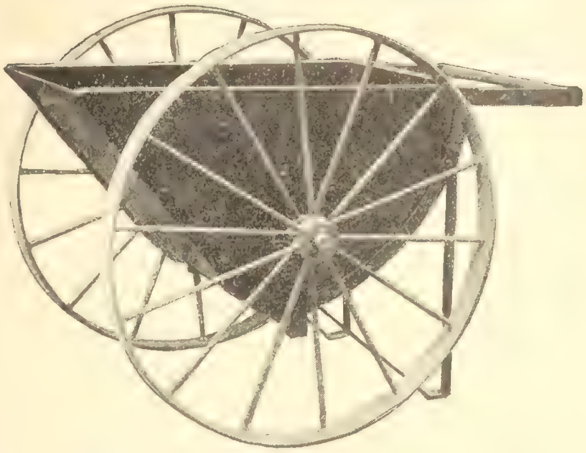

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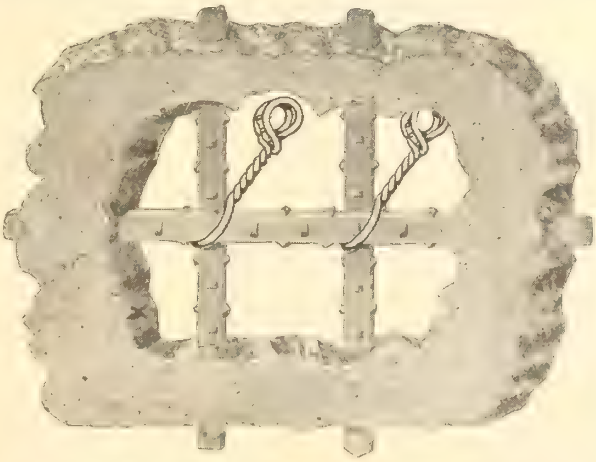

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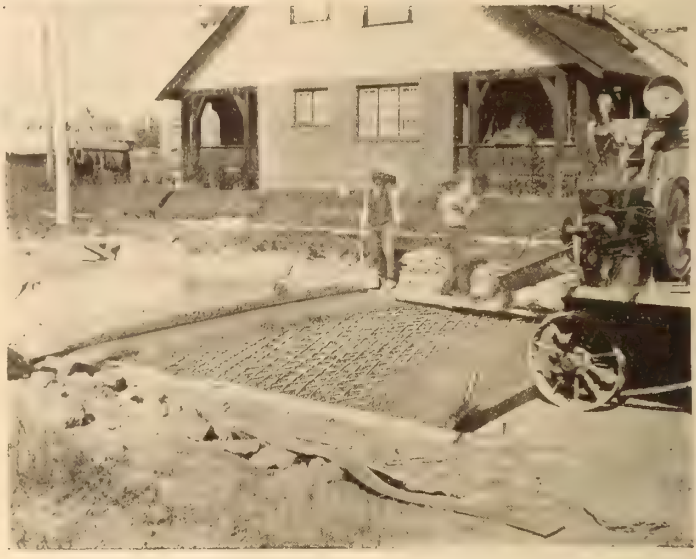

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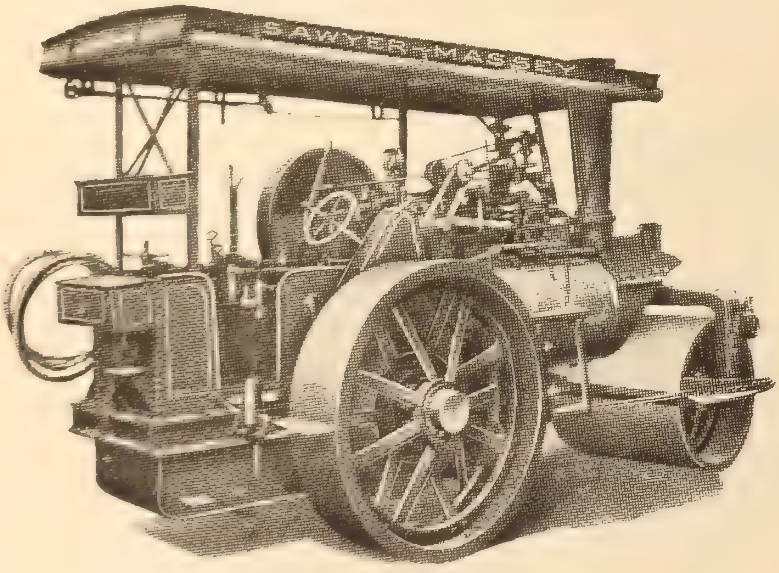

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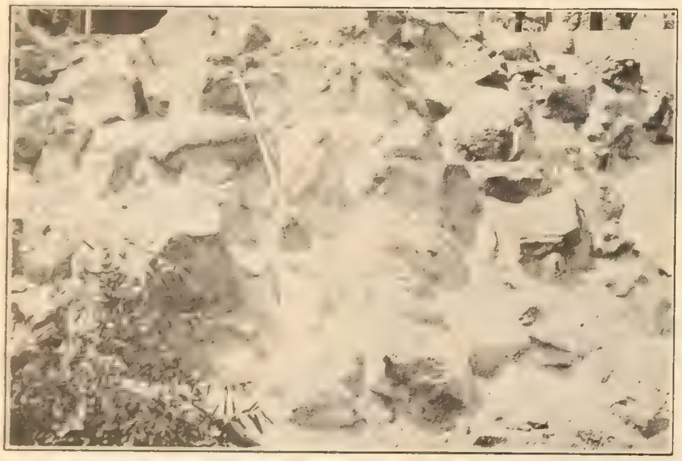

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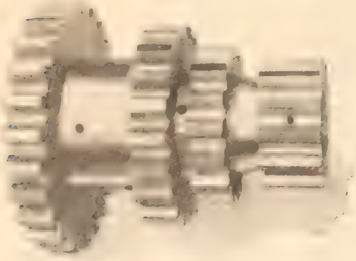

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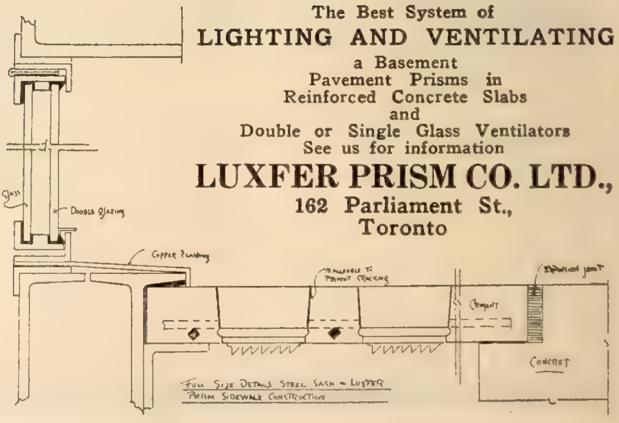
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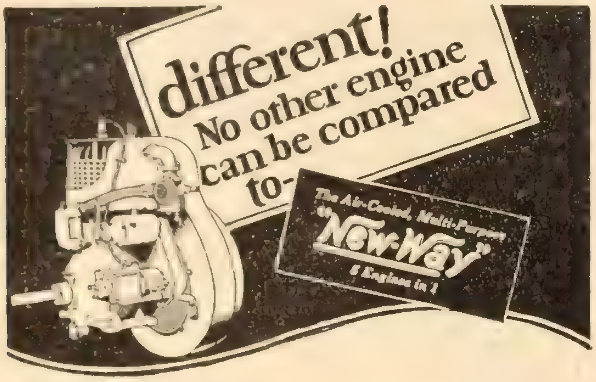
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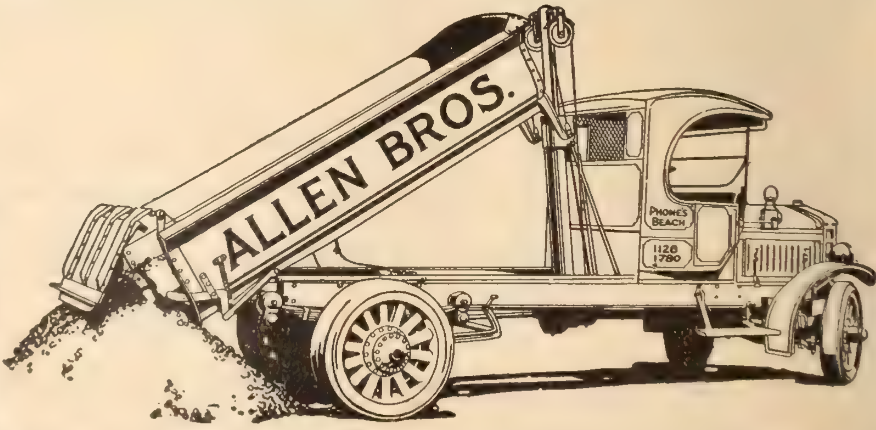

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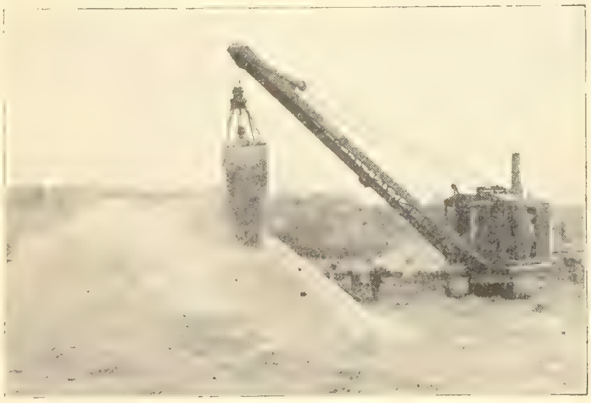

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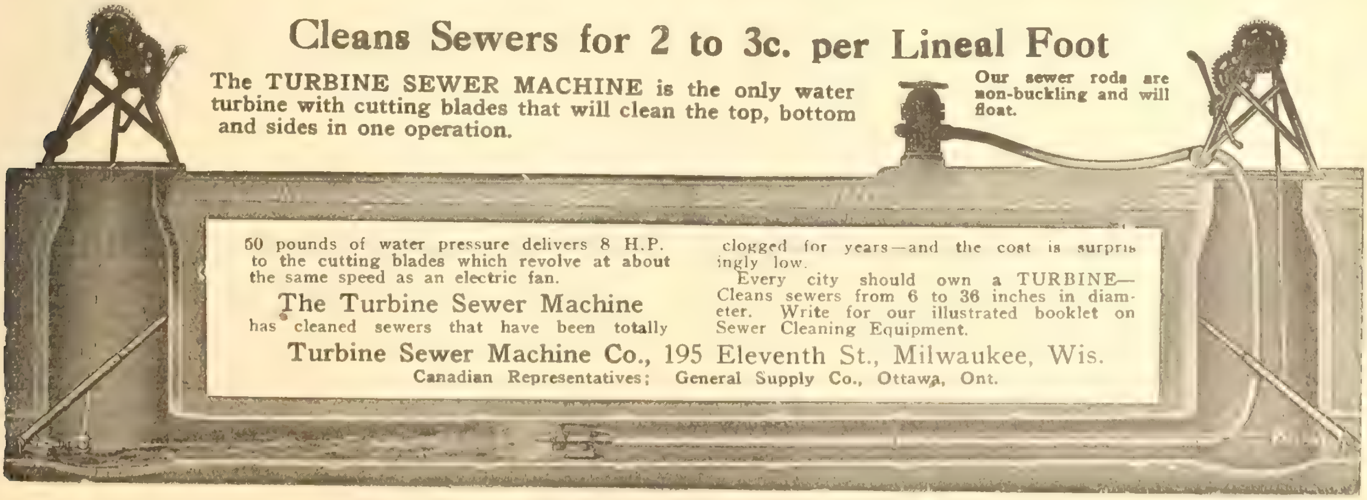

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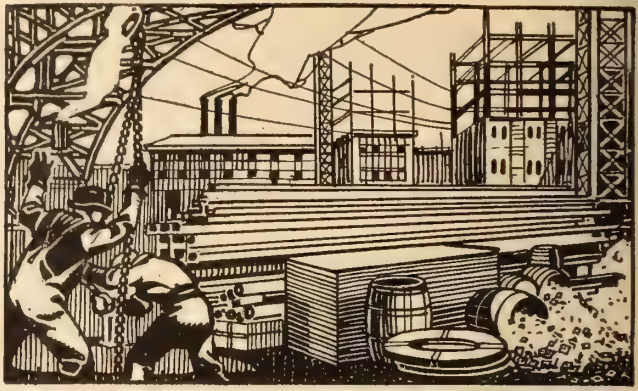

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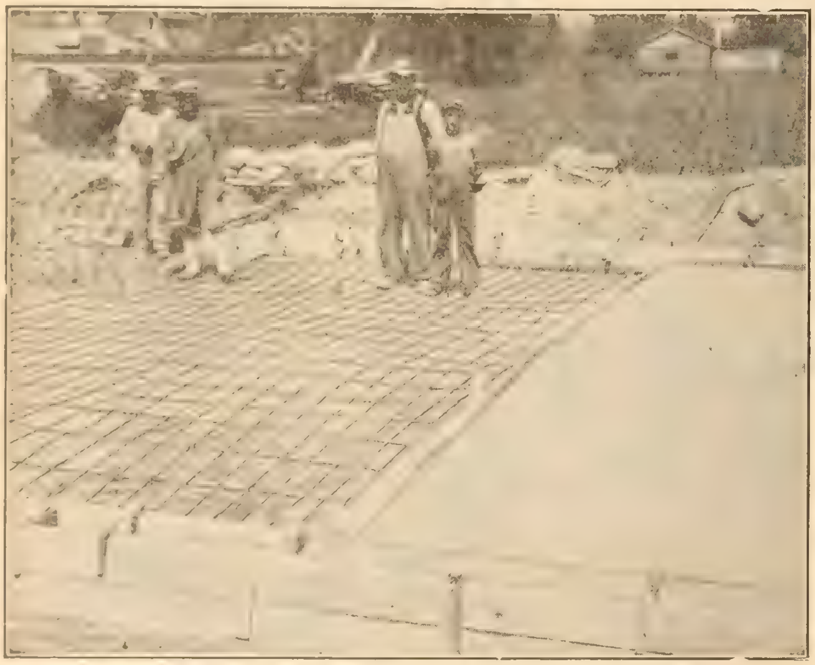

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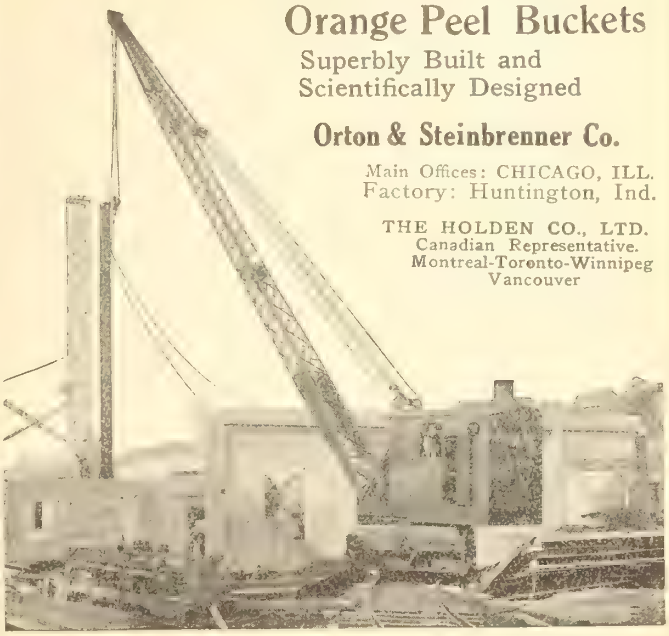

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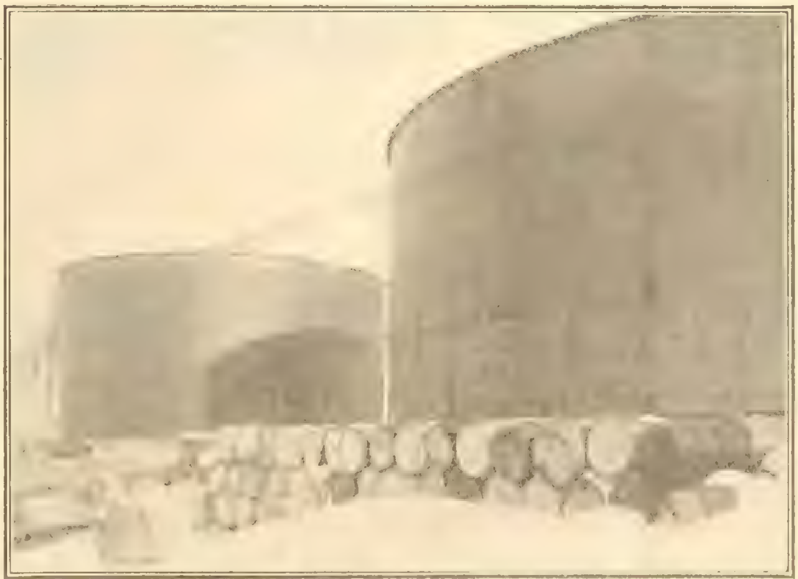

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Dipped and Wrapped

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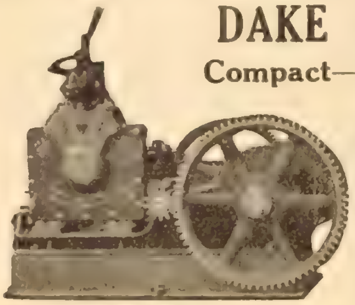

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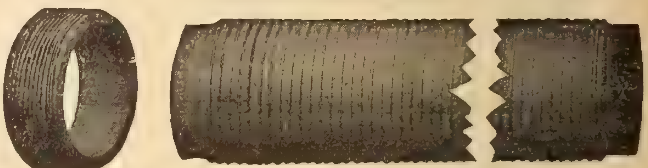

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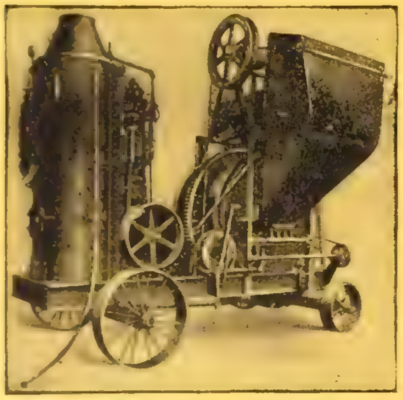

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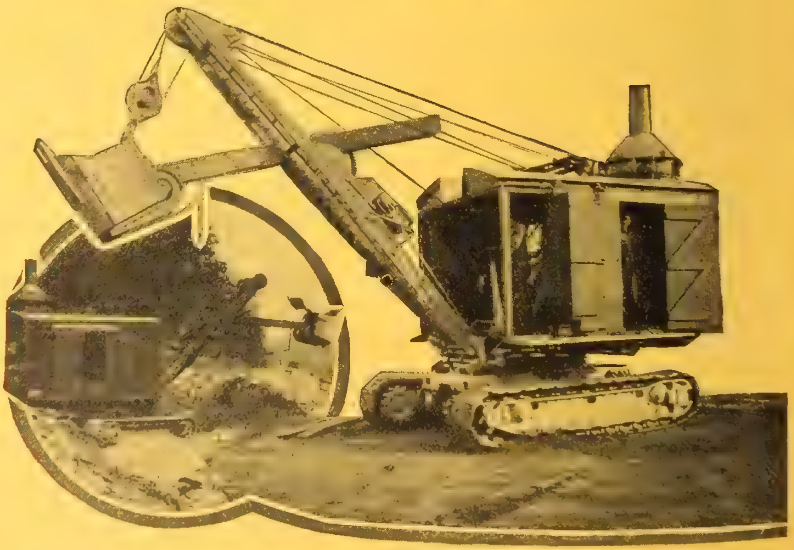

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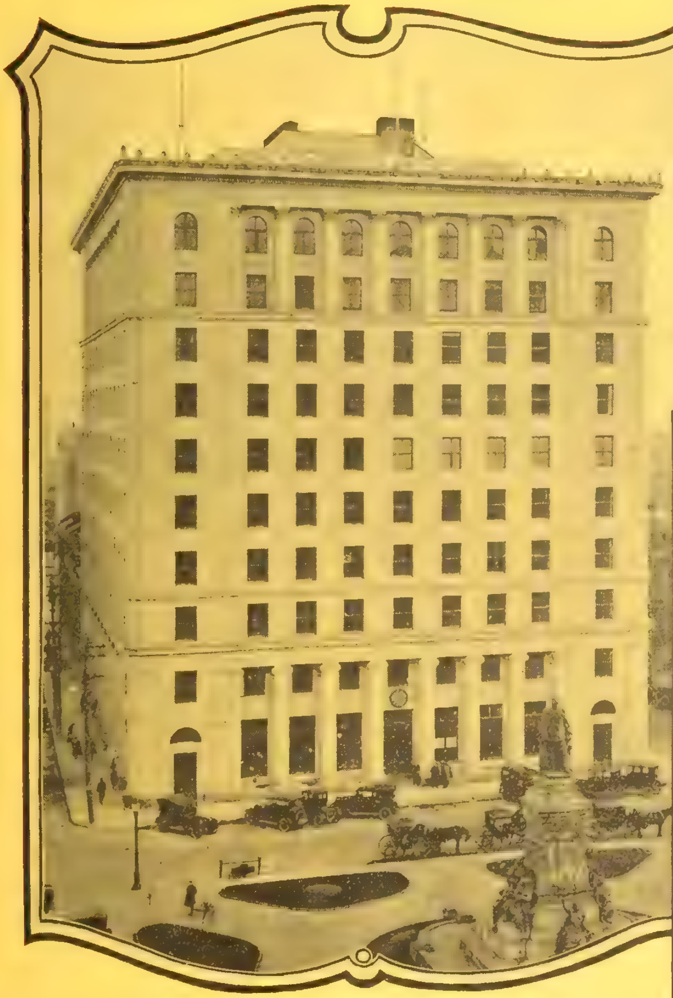
Vol. 37 Toronto, August 1, 1923 No 31

Contract Record and Engineering Review



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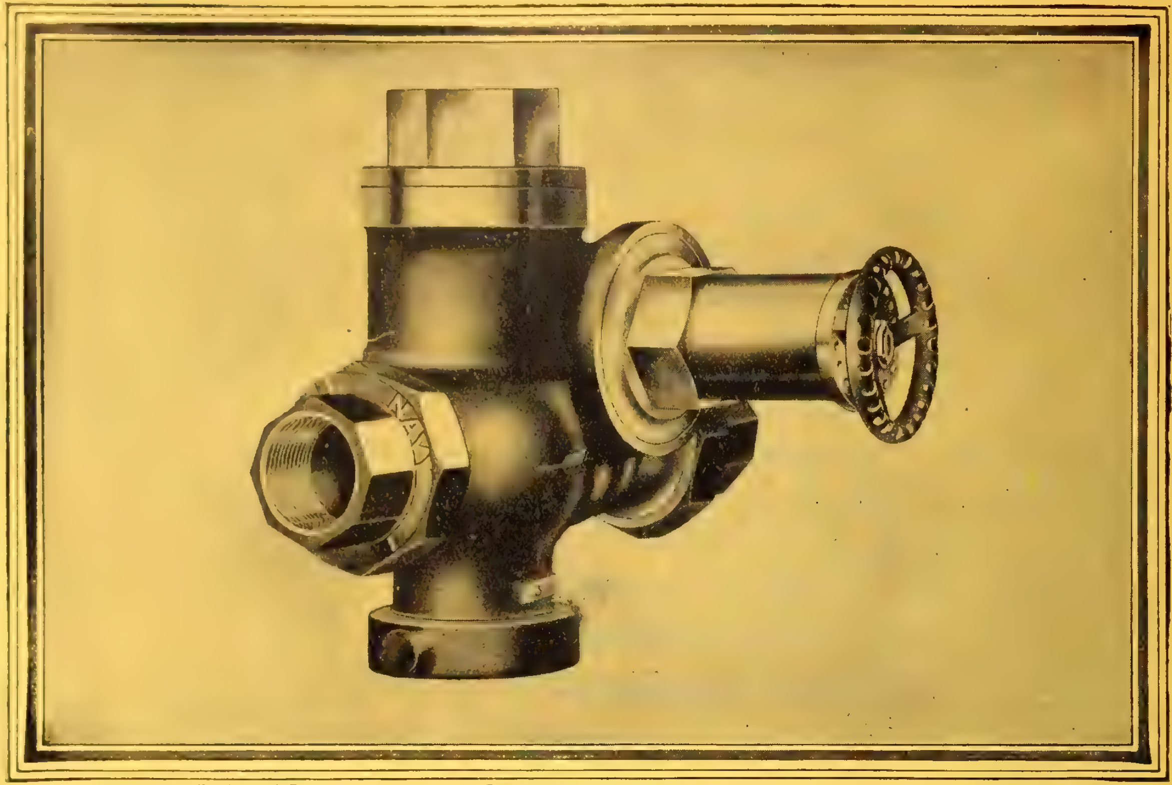

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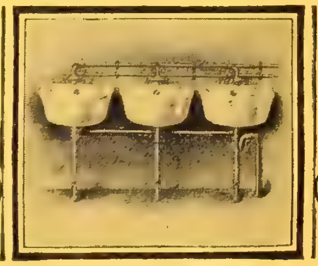
Works: Montreal, Canada, and Ipswich, England



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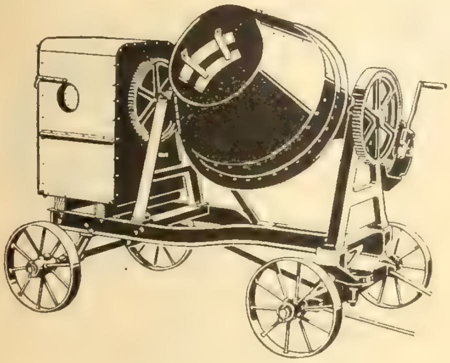
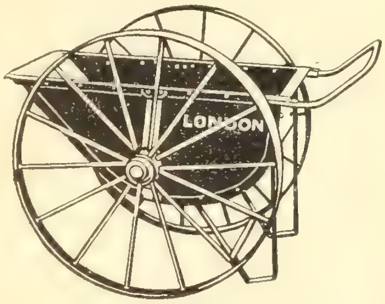


London Mixer, made in two sizes



London Concrete Cart No. 6

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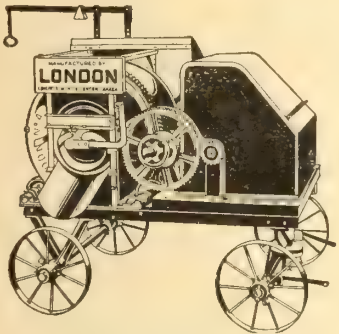
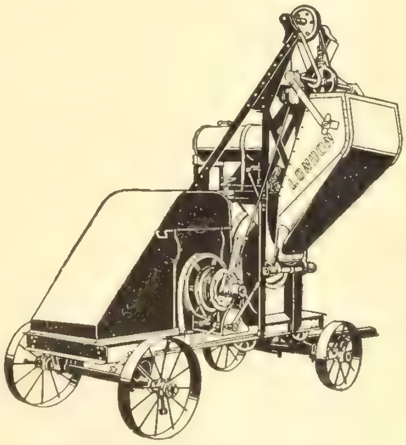


London Mixer. Made in three sizes

Our enormous business has been made possible by many satisfied customers. Every machine sold sells many more . This is the best guarantee possible. **"ASK THE MAN WHO USES THEM."**

Made in Canada

We manufacture Concrete Mixers, Hoists, Air Compressors, Pumps, Brick, Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.



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KOEHRING Crane designing engineers are seasoned men of specialized experience in the crane field. They have had full unhampered swing to improve on design and construction and have done so in countless fundamentals which give the Koehring an extra margin of strength, capacity and service life.

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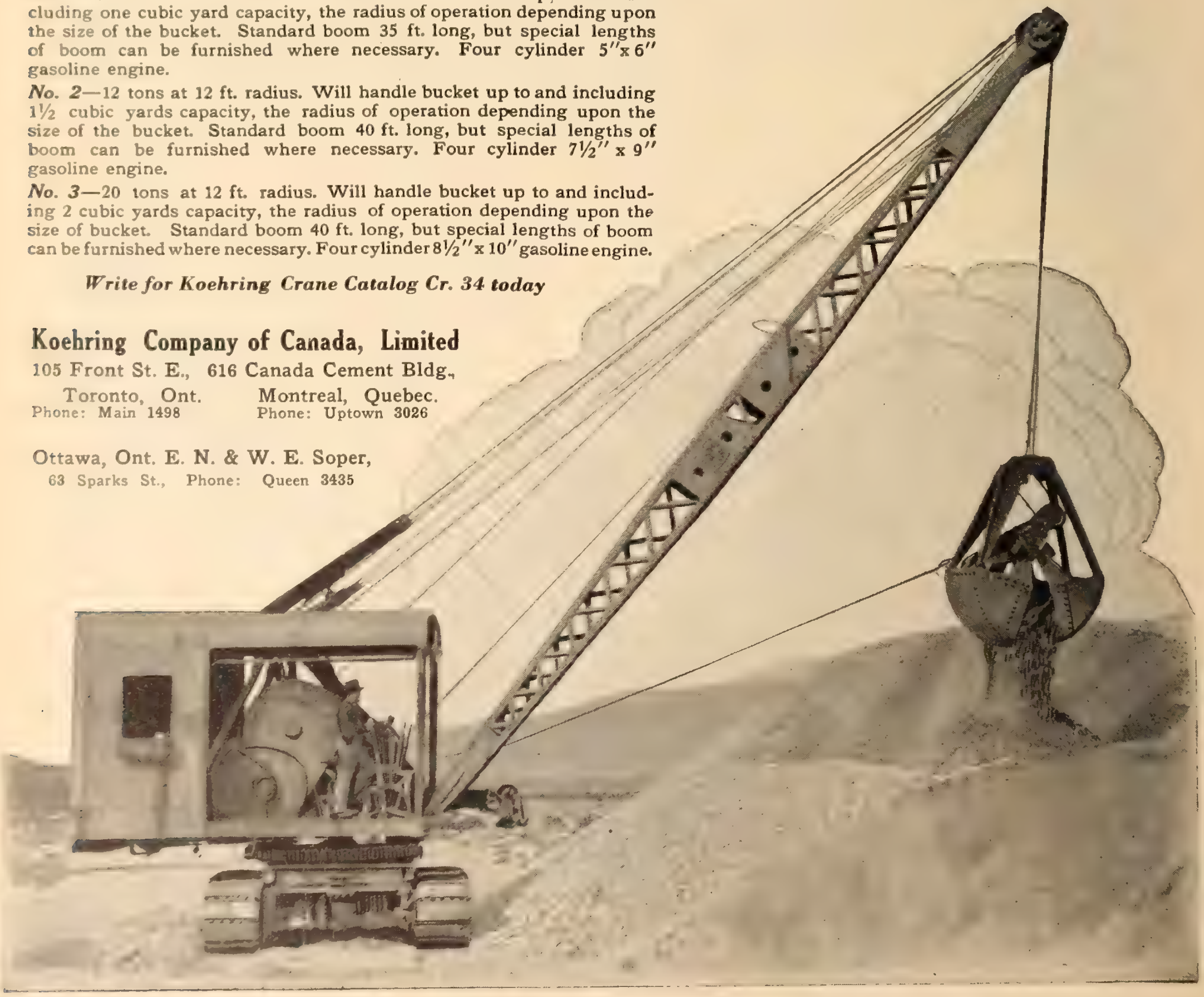

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Think what one fire that cannot be controlled could do to your community. Every day the newspapers carry accounts of fires that have wiped out great areas. Fire means losses in life, property and efficiency.

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TRADE MARK

CANADIAN DES MOINES

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  - Sturtevant, B. F. & Co.

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McCRACKEN SEWER PIPE
Is Winning Canada's Favor

Ottawa Saves $8000 on sewer pipe

Mr. A. F. McCallum, Commissioner of Works, Ottawa, Ont., replies to published criticism of the action of city council in adopting the McCallum recommendation for concrete pipe as against vitrified clay pipe. (See Ottawa Citizen, April 26th., 1923.) Mr. McCallum's letter to the Board of Control reads:

"It may be taken for granted that there are no acids in comparatively fresh sewage in this city to disintegrate concrete pipe made to our specifications under inspection and properly cured and tested regardless of the absurd statements made by the clay pipe people.

"Concrete pipe was easily made by small plants in a careless manner and as a consequence engineers have been prejudiced against it until recently when first class pipe in the smaller sizes has come on the market. For that reason we have not used it in this city for the sizes from 24 inches to 6 inches until recently, giving a monopoly practically to clay pipe.

"It is interesting to note then the difference in prices in 1921 (when there was no concrete pipe tender) with 1923.

Clay Pipe Tenders

	1921	1923
6 inch	.32½	.23
9 inch	.59	.41
12 inch	.91	.67
15 inch	1.20	.85
18 inch	1.70	1.27
24 inch	3.10	2.15

"In other words if we had not allowed tenders from the concrete pipe people we would have had to pay about $25,000 instead of $17,000 for this year's supply of pipe."

Write for complete information and quotations

John E. Russell Co. Limited, General Sales Agents
504 Harbor Administration Building - TORONTO

McCRACKEN
SEWER PIPE
"The Pipe That Endures"

McCracken Concrete Sewer Pipe is manufactured in accordance with standard specifications issued by the American Society for Testing Materials for Cement-Concrete Sewer Pipe, and inspected by the Canadian Inspection and Testing Company, Limited.

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American Enameled Brick & Tile Company

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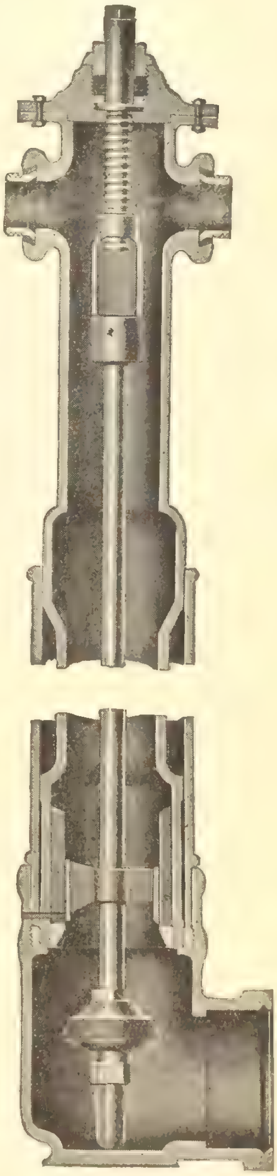
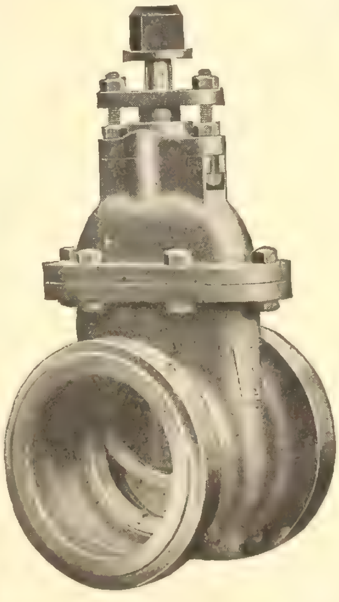
Prices right.
Write for prices and see.

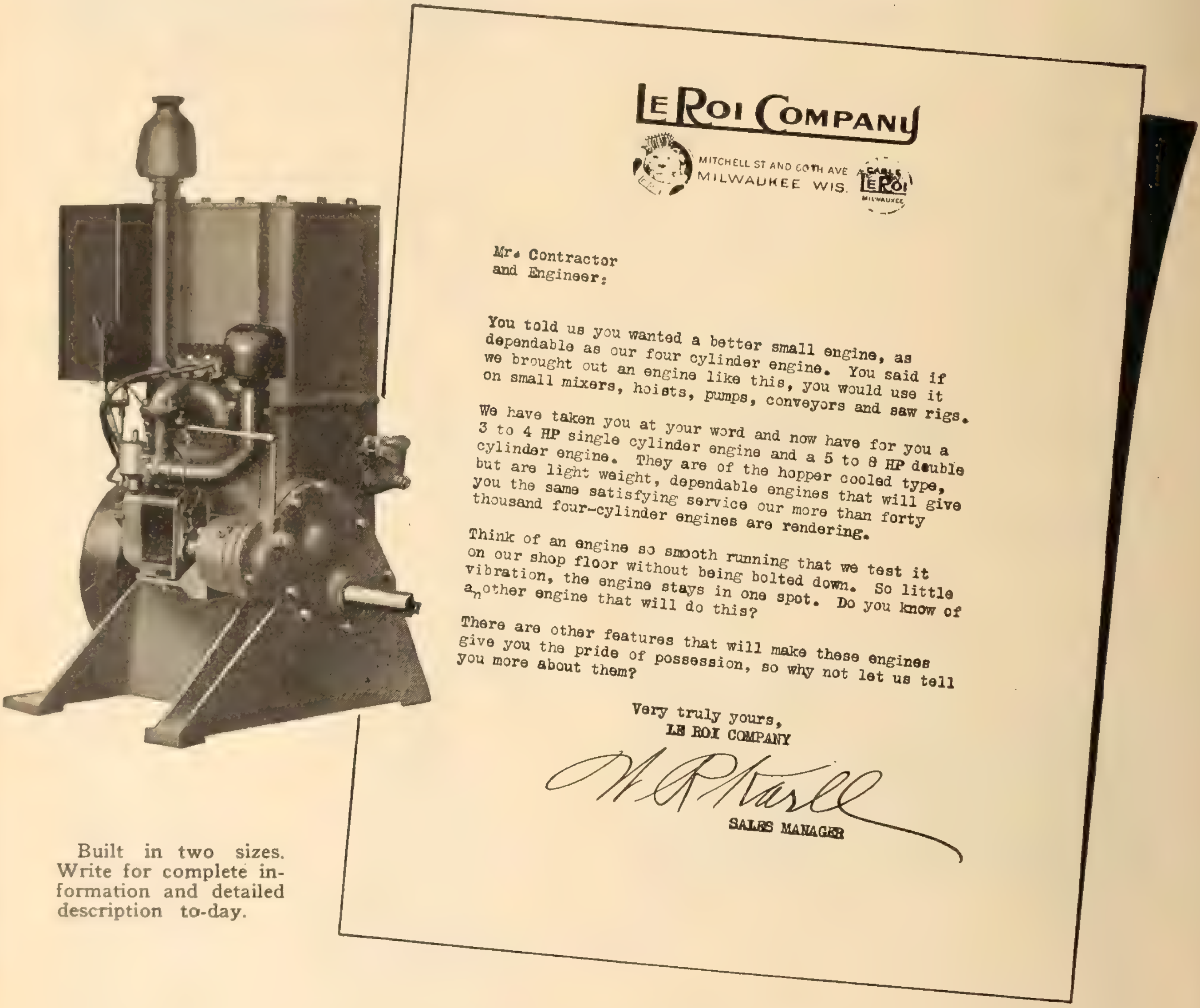




THE KERR ENGINE CO. LIMITED
VALVE AND HYDRANT MANUFACTURERS
WALKERVILLE, ONT.

An Open Letter To---

Contractors and Engineers



LE ROI COMPANY

MITCHELL ST AND 60TH AVE
MILWAUKEE WIS.

Mr. Contractor
and Engineer:

You told us you wanted a better small engine, as dependable as our four cylinder engine. You said if we brought out an engine like this, you would use it on small mixers, hoists, pumps, conveyors and saw rigs.

We have taken you at your word and now have for you a 3 to 4 HP single cylinder engine and a 5 to 8 HP double cylinder engine. They are of the hopper cooled type, but are light weight, dependable engines that will give you the same satisfying service our more than forty thousand four-cylinder engines are rendering.

Think of an engine so smooth running that we test it on our shop floor without being bolted down. So little vibration, the engine stays in one spot. Do you know of another engine that will do this?

There are other features that will make these engines give you the pride of possession, so why not let us tell you more about them?

Very truly yours,
LE ROI COMPANY

W. R. Karll
SALES MANAGER

Built in two sizes. Write for complete information and detailed description to-day.

LeROI COMPANY

5906 Mitchell Street **Milwaukee, Wisconsin**

LEROI ENGINES

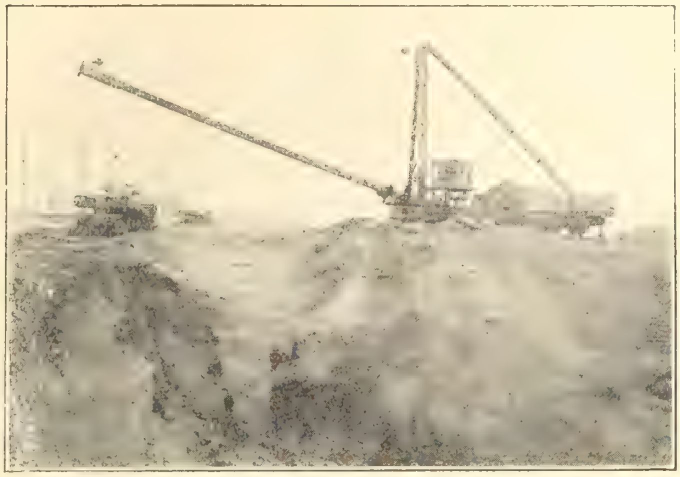
"for dependable power"

A
MEAD-MORRISON
DERRICK

Mead-Morrison Derrick Fittings are of the latest, most approved type, developed by engineering ability of the highest class after many years' experience in design, manufacture and use of Contractors' Equipment.

All details of construction have received most careful attention, thus insuring dependability under the severest serivce.

Information and prices gladly furnished on request.



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RAILWAY, MARINE AND CONTRACTORS SUPPLIES
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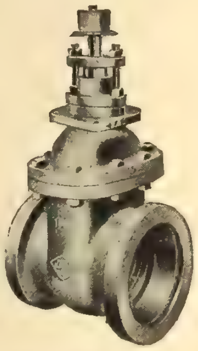

Fig. 400 F.M.

Regularly supplied to open by turning to the left. Can be furnished open to the right if desired.

This is Type "K" Jenkins Iron Body Standard Gate Valve

For Use With Indicator Post

Non-rising Spindle. **Hub Ends.**

Approved by the Fire Underwriters and, like all genuine Jenkins Valves, made to function satisfactorily under the strain of severe service.

You'll find this valve fully described in JENKINS Catalog No. 9—free on request.

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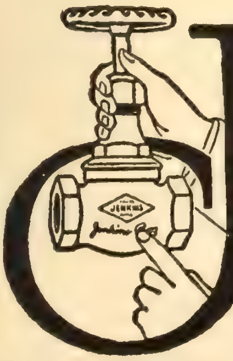
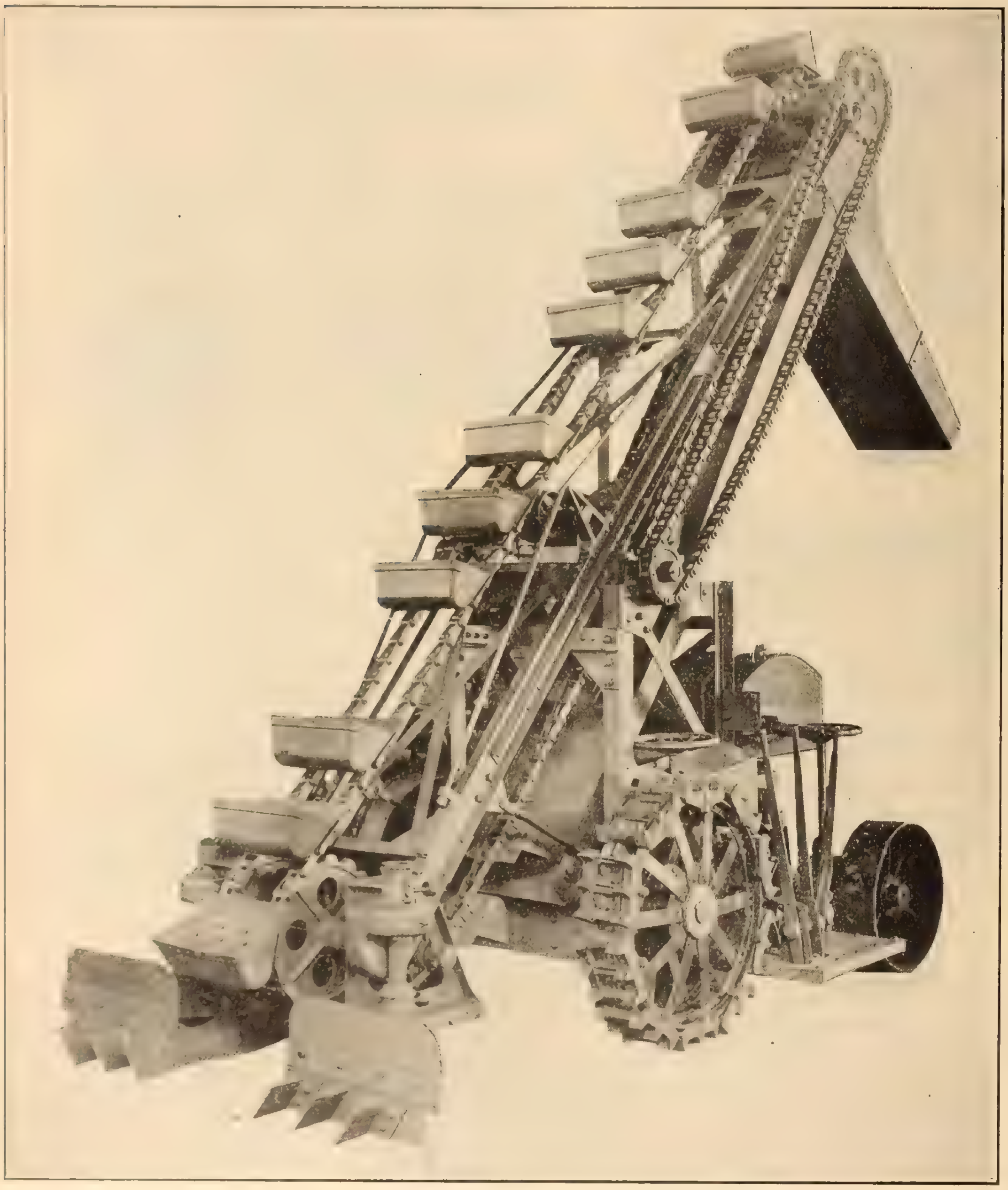


Always marked with the "Diamond"

Jenkins Valves

SINCE 1864

AUSTIN WAGON LOADERS



AUSTIN GRIP-WHEEL LOADER

AUSTIN MACHINERY
"MOVES THE EARTH–MIXES THE CONCRETE"
TRADE MARK

Austin Features

RUGGED CONSTRUCTION

POSITIVE ACTION

LARGE CAPACITY

FAST OPERATION

LOW UPKEEP

AUSTIN MACHINERY
"MOVES THE EARTH–MIXES THE CONCRETE"
TRADE MARK

AUSTIN LOADERS can be supplied with all multipedal traction, plain wheels, or Grip Wheels as illustrated. All are **one man** machines and all are equipped with the famous Austin Feeding Device, the most positive known.

AUSTIN LOADERS have a very large capacity, from 1 to 1½ cu. yds. per minute with a digging width of 7 ft. and a discharge height of 9 ft. 2 in.

AUSTIN LOADERS will handle loose bulk materials such as crushed stone, gravel, sand, coal, etc., at a fraction of the cost of hand work. Write for descriptive literature.

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WOODSTOCK, ONT.

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Alberta: McAuley, Bell & Morris, Calgary.
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Don't Scrap Machinery—Save it!

THE ready convenience and quick work of oxy-acetylene cutting and welding is saving innumerable dollars' worth of valuable machinery for others—might it not do the same for you?

The purity of Dominion Oxygen and Prest-O-Lite Acetylene assures the hottest flame and the utmost fuel economy.

Dominion Service, through a wide-spread system of distributing points, provides quick shipments of supplies and short hauling distances.

A representative will welcome the opportunity to explain Dominion Service to you.

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DOMINION OXYGEN COMPANY LIMITED

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General Offices: 80 Adelaide St. East, Toronto

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GRAB BUCKETS

For handling coal, sand, gravel and bulk material of like character, on guy and stiff leg derricks, locomotive cranes, overhead cranes; in fact on any type of hoisting mechanism equipped for two line bucket work.

All sizes in stock for immediate shipment.

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Made in Canada

CANADIAN MEAD-MORRISON CO.
LIMITED
CANADA CEMENT BUILDING
MONTREAL
WORKS: WELLAND ONT.

Compressed Air for the Road Builder
Ingersoll-Rand
Compressed Air for the Road Builder
R 216

Thousands of copies of this booklet have been read by road contractors, etc. If you have not received your copy write for one to-day.

Use more air---and speed up the road work

Speed of road construction and lower costs are dependent upon the use of more labor-conserving and time-saving machines. More Compressed Air Tools will help do this and give Canada more and better roads.

The Roadbuilder can use air and Ingersoll-Rand equipment in many ways:

Rock Drilling with "Jackhamers" for digging excavations, cuts and quarrying for foundation and surface materials.

Tamping back-fill with "Little David" Rammers.

Breaking up pavement and old surface with "Paving Breakers."

Tamping track ballast with "Imperial" Pneumatic Tie Tampers.

Calking pipe joints with "Little David" Pneumatic Tools.

Hoisting rock, laying pipe, skidding timbers and forms, back-filling and hauling cars with "Little Tugger" Hoists.

Driving Direct Acting "Cameron" Pumps.

Canadian Ingersoll-Rand Company, Limited
Sydney Sherbrooke Montreal Toronto Cobalt
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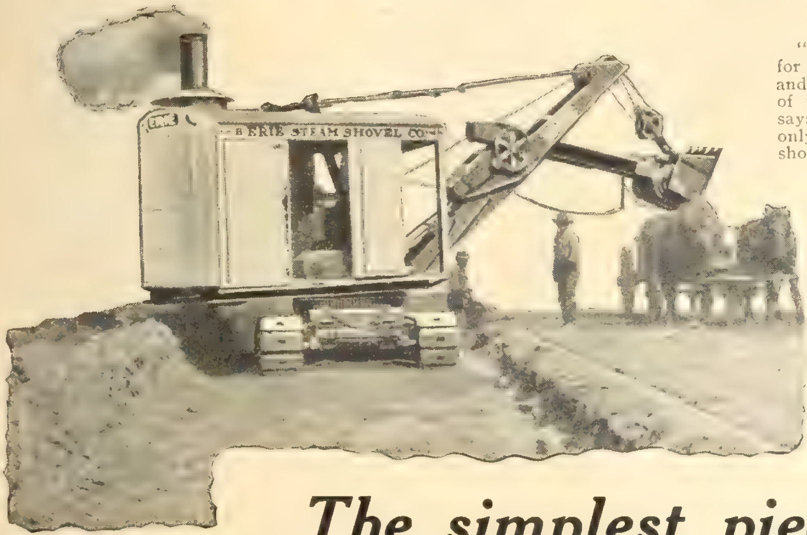
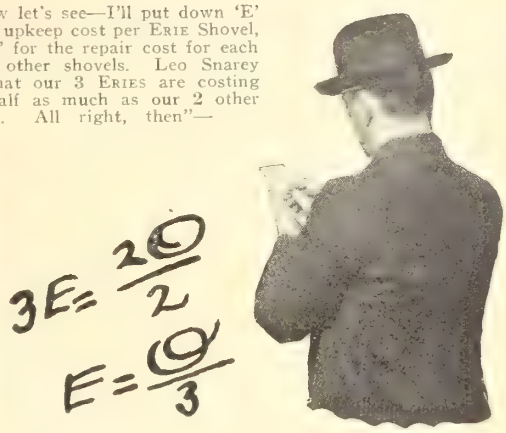
Ingersoll-Rand

Most sections have only 150 to 200 days a year of good weather suitable for outside work

Use the Shovel that WORKS EVERY GOOD DAY



"Now let's see—I'll put down 'E' for the upkeep cost per Erie Shovel, and 'O' for the repair cost for each of my other shovels. Leo Snarey says that our 3 Eries are costing only half as much as our 2 other shovels. All right, then"—



The simplest piece of figuring that ever earned a contractor thousands of dollars

There is valuable expERIEnce for every contractor in letters like these:

"For reliability and low upkeep cost the Erie is the very best shovel and crane we have ever used.

"Our Erie has worked steady for 26 months in the hardest kinds of work, excavating, grading, and as a locomotive crane with clam-shell for unloading cars. Repair bills have been practically nothing."—**J. J. Harrison, Allen & Harrison, Oklahoma City, Okla.**

"I have run about every known make of steam shovel, and I have not seen one that can compare with the Erie. Our Eries have been excavating for buildings for more than 8 months, sometimes nearly all rock, and we have spent nothing for repairs. We get anywhere from 400 to 800 cu. yds. per day from each." —**E. W. Cronin, Cronin & Driscoll, Roxbury, Mass. (Own 2 Eries).**

"Our experience with various makes of shovels shows that the Erie is the best. Upkeep costs on the Erie are much lower; for reliability the Erie is the best machine we know of.

"Our Erie is now stripping coal, giving from 400 to 800 cu. yds. per day on this work."—**W. M. Virgin, Wilkinsburg, Pa. (Owner of 2 Eries).**

Steady service is the most important feature of any piece of construction machinery. It pays to use equipment that is

RELIABLE

Julius Porath, the Detroit contractor, finds that his 3 Erie Shovels cost only half as much to keep up as 2 shovels of other make. Or figured in repair cost per machine, EACH ERIE SHOVEL COSTS ONLY 1/3 AS MUCH TO KEEP IN SHAPE.

If this saving in steam shovel upkeep had been reported by only a few contractors, it would mean **nothing.** Five or six such records, or even a dozen, would be only a short step toward actual proof.

But **hundreds** of letters like the few at the left—letters from contractors in all parts of the country, doing every class of work—have **proved conclusively** that when you use Erie Shovels and Cranes, your repairs are cut to about one-third.

The saving in repair expense is a big item—**but even more important is the saving in precious working time.**

BEFORE YOU BUY A SHOVEL OR CRANE

make it a point to talk with some owners who have had years of experience with different machines.

Just as a starter, we can send you copies of many letters from such contractors, telling their experiences—also many carefully checked records of actual upkeep costs on Erie Shovels. Write us.

ERIE STEAM SHOVEL CO., ERIE PA., U. S. A.

Incorporated 1883; formerly BALL ENGINE CO.

Builders of ERIE Steam Shovels, Locomotive Cranes, Railway Ditchers

ERIE Revolving Shovels

Erie Steam Shovel Co Erie, Pa.

Part of Longueuil, Chambly Road, Que.

Concrete pavement on 16th sideroad Chatham Township, Ont.

Modern Highways For Modern Traffic

The determination of the people to have roads equal to the traffic they bear, has led to a yearly increase in the yardage of Concrete Paving constructed in Canada.

But the construction of Concrete roads even to-day, is not keeping pace with the output of motor vehicles. The motor truck has revolutionized road traffic—has created a positive need for Concrete Highways.

The country's requirements call for an even greater speeding up of Canada's modern road building programme.

Highway traffic continues to increase; the tonnage of loads constantly grows, emphasizing the importance of fuel saving, skid-proof, really enduring pavements such as Concrete supplies.

Concrete roads lighten the taxpayer's burden by practically eliminating upkeep. The lower haulage costs benefit both farmer and consumer. The even surface invites tourist trade and promotes the comfort and well-being of every user.

Literature on Concrete Roads will be gladly sent to any reader interested.

Specify
CANADA CEMENT
Uniformly Reliable

CANADA CEMENT
CONCRETE
FOR PERMANENCE

We maintain a Service Department to co-operate in all lines of work for which Concrete is adapted. Our library is comprehensive and is at your disposal at all times without charge.

Canada Cement Company Limited

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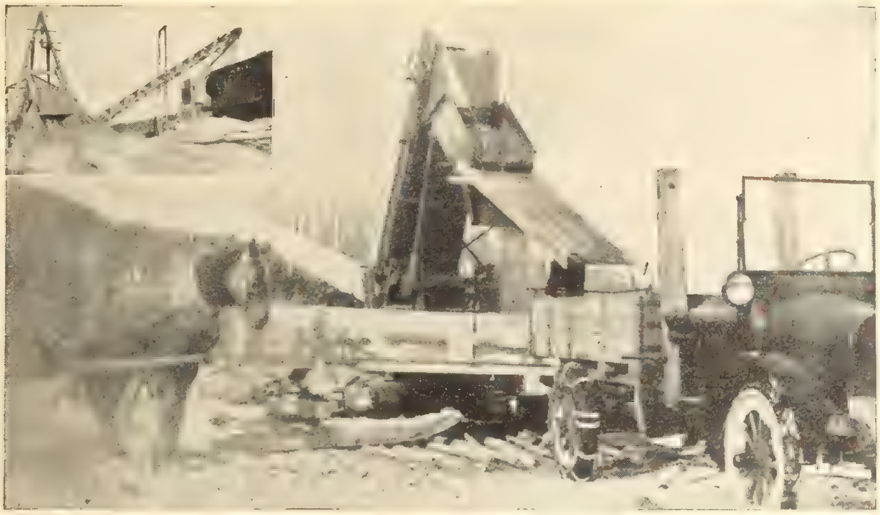
MUSSENS M LIMITED



Operating a Barber-Greene Bucket Loader in a Michigan gravel pit in weather 18 below zero. Above, Barber-Greene Conveyor used in a beach sand plant near Cleveland.

18° below—90° in the shade—and men

The high cost of warm weather in sand and gravel pits is becoming an increasingly powerful influence in the purchase of labor-saving equipment. Every man has his limit and in extreme weather it is reached much sooner than under average conditions.

That is why users of Barber-Greene Bucket Loaders and Conveyors are telling our representatives that the profits made with this machinery are much greater than they at first supposed.

Some bought their Barber-Greenes because they wanted to do more work with fewer men, others because they wanted to speed up output; but only a few figured in the savings made by being relatively independent of muscle power in hot and cold weather.

Olaf Oleson, of Foster City, Michigan, was one of the first to find this out. The photograph shown above shows how he operated a gravel pit when the weather was 18 below zero.

He then used only one truck and did the rest of his hauling with logging sleds. He "shot" the bank, stripped by breaking the frozen soil off in lumps, dug out the gravel with a Barber-Greene Loader and screened it with the aid of a grizzly attachment.

In spite of the extreme weather his operations show a favorable cost because he is practically independent of muscle power. In the hot weather he operates differently, but stlll enjoys the same advantage of having production about as "level" as it can be.

For additional information about Barber-Greene Loaders and Conveyors, and how they are being used to make up for the shortage and high cost of labor, send for our N cost reports and catalog.

Ask our nearest office for particulars

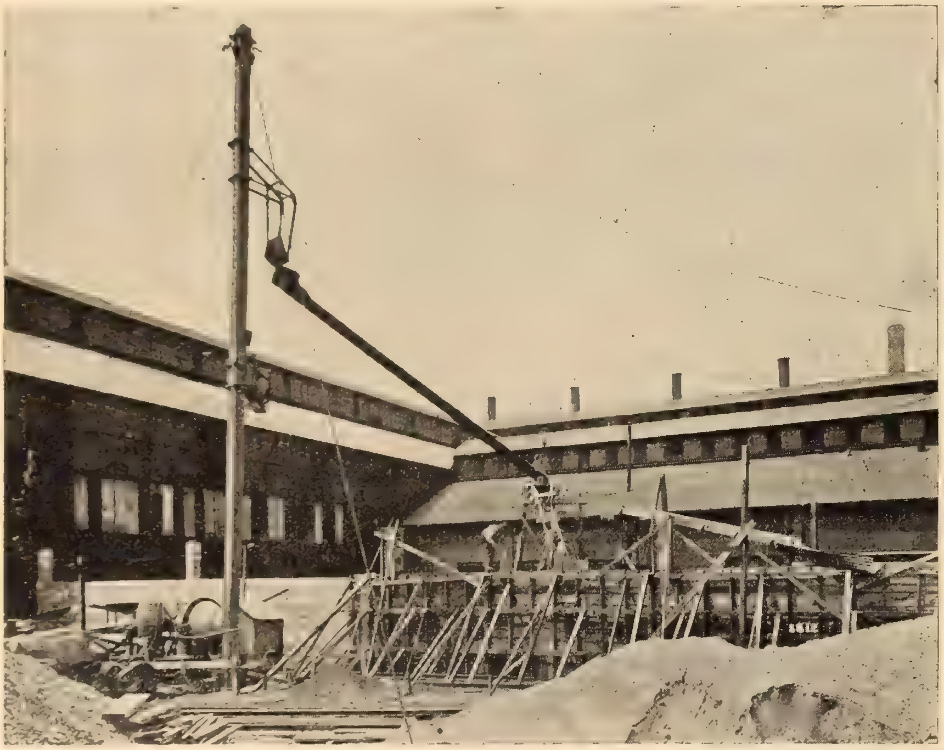
MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

MUSSENS M LIMITED

DON'T OVERLOOK THIS—

It is worth your while to investigate the



INSLEY MAST-HOIST BUCKET PLANT

An effective piece of equipment for placing concrete quickly and economically.

Only one mast to erect—An eight foot bucket runs up and down the mast.

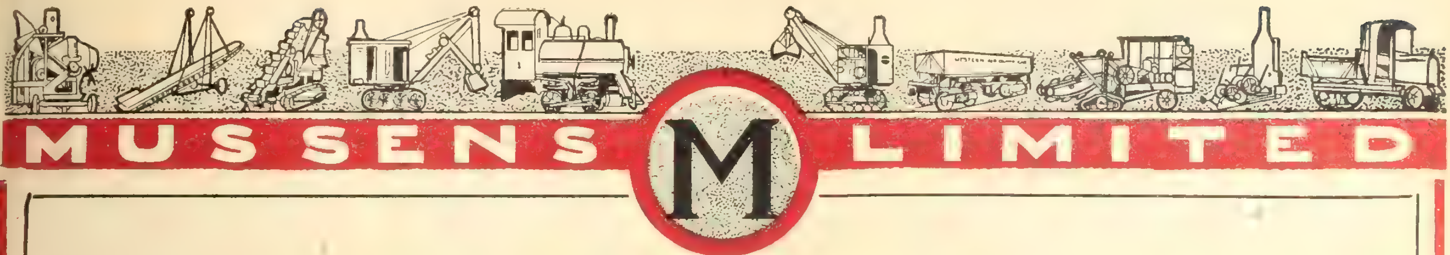
Ask our nearest office where you can see one at work.

Insley Towers, Chuting, Buckets and Cars Specially Designed for Practical Concrete Work

Send for Catalogue

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver



PARSONS

"I am very pleased to recommend this machine" **Burton Lowther, Chief Engineer, Denver**

Mr. Lowther, Chief Engineer and General Superintendent of the Denver Municipal Waterworks, writes as follows of his experience with the model 36, which was purchased several months ago:—

"I am pleased to say that this machine has given us very satisfactory service. We have used this excavator for DIGGING FROZEN SOIL AND IN VERY HARD COMPACT GUMBO and it has never yet refused to do the work required of it, in a very satisfactory manner."

The Parsons is a paying, practical proposition in any soil short of solid rock. If you have trenches to dig Pick a Parsons and Stop Picking.

Send for a copy of our illustrated Bulletins.

TRENCH MACHINES

AND

BACKFILLERS

Ask our nearest office for particulars

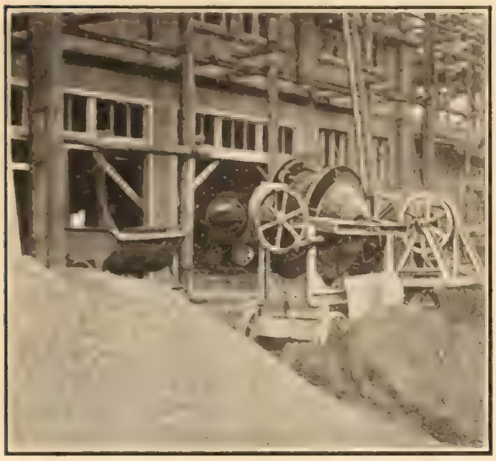
MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

ONE MACHINE!

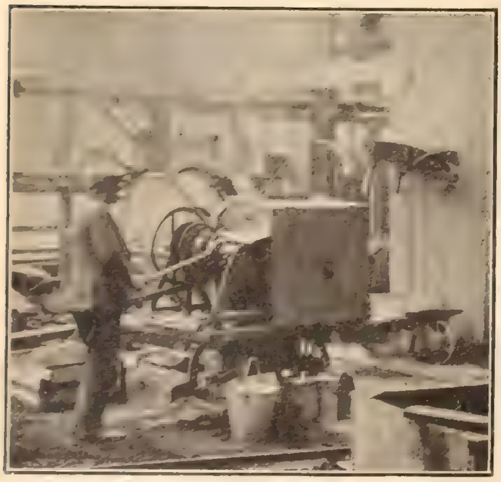
Three Operations!
Three Savings!

AT WORK ON THE WORLD'S LARGEST STADIUM

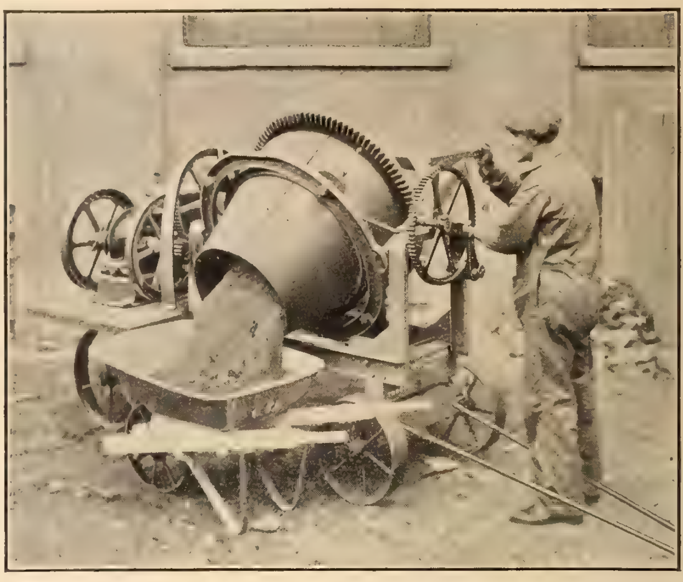


Mixing Concrete at the rate of from 3 to 6 cub. yds. an hour at the Aston Villa Stadium at Birmingham, England. One man operates the machine. Loads or discharges on either side. Note the second machine indoors.

The same machine mixing cement mortar. Not only is the work done faster and with fewer men, but also a more perfect mix is secured. The cream of the cement is saved.



A handy hoisting rig that saves time, needs no rest, never lays down on the job, and cannot be crowded too hard.



Wettlaufer Mixers have only modern, improved engines of horizontal, hopper-cooled type equipped with dependable magneto. Fuel consumption less than a gallon a day. Engine is covered with dust-proof Steel Housing.

CAPACITY 5 CUB. FT.

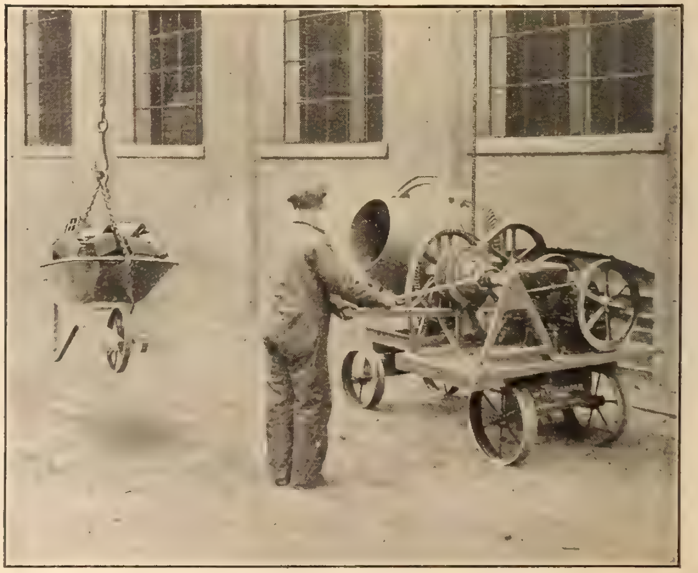
This is the machine you need if you want to make money on this year's contracts

The Wettlaufer O-Power Mixer shown in these pictures will enable you to make money out of small jobs and to finish-up on bigger jobs in record time at less cost. Prices and full particulars on request. Write for folder No. 150.

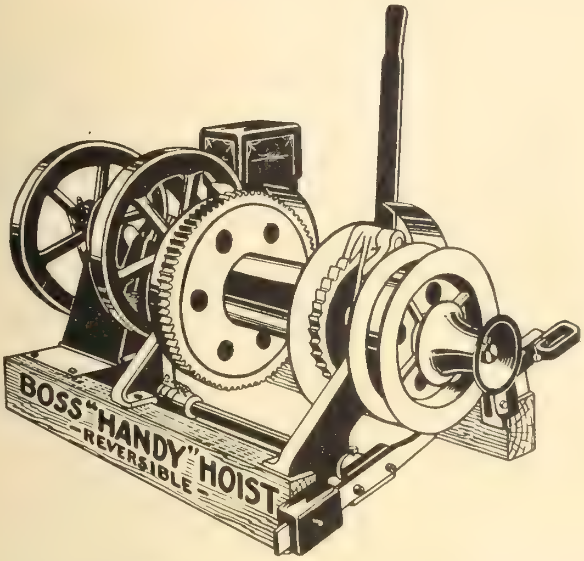
WETTLAUFER BROS., LIMITED

Concrete Machinery and Contractor's Equipment
Head Office: 194 Spadina Ave., Toronto

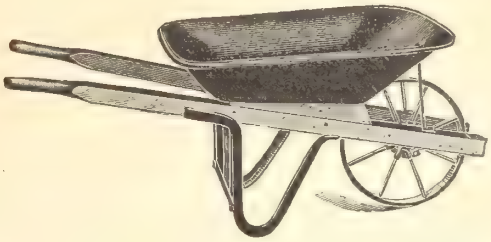
Wettlaufer Machinery is sold by all branches and agents of Canadian Fairbanks-Morse Co., Limited.



The O-POWER with Hoisting Attachment. Note that it is equipped with Roller Bearings and Centre Oil Feed System—giving longer life. The machine can be drawn around by one man—taken through an ordinary doorway—drawn behind or loaded on an ordinary cart.



A "BULLFROG" Wheelbarrow No. 22a4



Pressed Steel Tray—
"Never Break" Wheel
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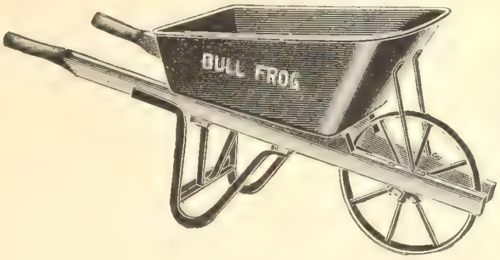

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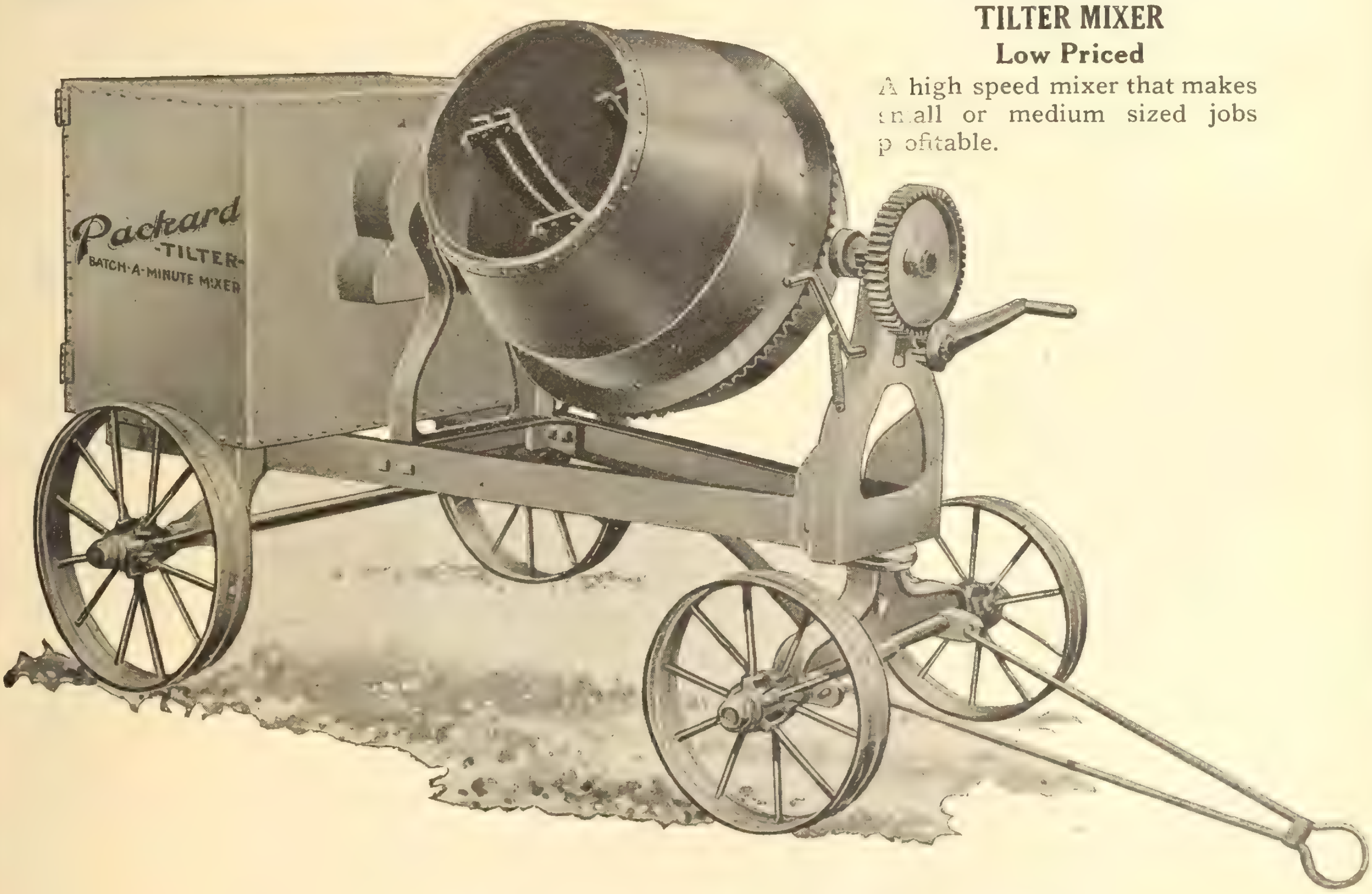

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They Were not Looking for "Work"

Some days ago Mr. Tom Moore, president of the Trades and Labor Congress of Canada, published an item to the effect that a number of carpenters and plasterers had been induced to come into Canada on the definite promise that they would be given work, and that after they arrived, there was no work for them. A case was cited in Montreal where a number of these disappointed mechanics were to be found. The circumstance was used as an argument against the government using further efforts to induce mechanics to come to Canada from England.

The matter was taken up by the secretary of the Association of Canadian Building and Construction industries with the president of the Montreal Builders' Exchange, Mr. Douglas Bremner, and Mr. Bremner's reply is interesting. Quoting from his letter to Mr. Reiley, we have the following information:

"As regards the statement that plasterers and carpenters were induced to come to Canada and promised work on their arrival, I might advise that I am familiar with the whole situatoin and must emphatically state that this is not correct, as no arrangements whatever had been made in regard to carpenters or plasterers.

"There were, however, men of other trades coming to Canada on the Megantic, and these men, of their own accord, joined the party. The men who were engaged are now very happily located in Canada and have made arangements already to have their wives and families join them.

"It is true that a certain few carpenters availed themselves of the opportunity to come to Canada, but upon arrival, when work was offered to them at the prevailing rate of wages in Montreal, they declined it and stated that they had been promised a wage of a dollar per hour. As they had reported to the Builders' Exchange at Montreal of their own accord, an endeavour was made to find employment for them, but I am advised that in every case they declined to work at the rate of wages at present prevailing in the city.

"The Builders' Exchange at Montreal in no way accepts the responsibility for their coming and, furthermore, can produce affidavits, if necessary, from the men who were engaged to come to Canada to show that they were more than satisfied with the positions offered them and to state that, instead of the conditions being misrepresented, they were actually very largely under-estimated."

The Value of Tourist Traffic

It is said that Switzerland collects a revenue of $250,000,000 a year from tourists. Of this amount $50,000,000 comes from the United States. Indeed the sum total of the expenditures of the U. S. tourist traffic in Europe reaches hundreds of millions of dollars. France is estimated to get $700,000,000, Italy $100,000,000, Norway $10,000,000 and so on. One is led to ask—why should this money leave the continent of North America when the scenery of Canada compares favorably with anything to be found in the countries named.

The secret probably lies in the extent to which the Euponean continent has recognized the possibilities of income from the tourist traffic. On this continent we have underestimated the beauty of our scenery and the attractiveness of our summer and health resorts. In the comparatively few cases where publicity has been used to develop the tourist business exceedingly gratifying results have been obtained. As an example British Columbia is estimated to profit to the extent of $20,000,000 from its tourist traffic—more than the Province receives from its fishing industry, which has long been recognized as one of its stable sources of income. Millions of dollars are also spent in the Province of New Brunswick and it is estimated that some $10,000,000 is spent in each of the Provinces of Quebec and Ontario—in the latter two provinces, without any propaganda of any kind.

These figures create visions of great opportunities in this direction. The results in British Columbia have been obtained largely through concentrated effort on the part of the municipalities, led by the City of Vancouver. Logically it appears to be a problem for each province, but it is a lamentable fact that no concerted effort is being made to collect some of the billion-odd dollars that are leaving the United States for Europe. We are spending large sums of money on our highways. The scenery along these highways is magnificient. We have as delightful rest and recreation resorts as are to be found in the world. We are gradually building up fine hotels and other accommodation to supply comfort and service. Our railway systems are equipped to care for much more traffic than is offering—why then do our various municipalities not get together in provincial groups, each working for its own province—to make the advantages, the beauties, the health-giving properties of this northern country known throughout the world, and more particularly the United States? Incidentally this propaganda work in foreign countries may have the effect of educating our own people in the value of their own resources in the way of summer outings. Far too many of our people head south for their summer holidays. By all the rules of common sense they should go north. We need fewer Canadians who admire the waterfalls of Norway without having seen our own Niagara Falls; fewer Canadians to gaze in awe at the Alps, who have never seen our own Rockies.

Put the Lid on

Following the move to put some form of embargo on the export of Canadian pulpwood, our U.S. neighbors are pretending to be very much put out at what they are pleased to suggest would be an unfriendly act. Such an interpretation cannot be considered seriously unless it can be judged unfriendly to lay claim to what is one's own. We are simply minding our own business, and the reason it is causing comment is that we have delayed overlong to do this. Not only should our pulpwood be manufactured into its final product before leaving Canada, but the same should apply to all our raw materials—our timber, our minerals, our wheat, our waterpowers. We are simply playing into the hands of national commercial competitors as long as we fail to do this. If foreign capital prefers to manufacture its own finished products there is no law against its coming into Canada and doing so.

Are we afraid? Must we admit that we have all the essential resources for a great country except "backbone." The decision rests with our Dominion Government to-day.

The Week's Developments in a Nutshell

The event of the week is the sale of a twenty-two and a half million dollar Canadian National Railway bond issue to a syndicate of Canadian brokers. This is the largest bond issue that Canadians have undertaken to absorb for some time, and it indicates the confidence with which financial interests view the potentialities of the home investment market.

Day to day observations lead to the frequent remark that we are not getting back to pre-war conditions. A wider retrospect proves that we are, and the price at which this bond issue is taken up—a five per cent. bond at slightly less than par—is proof that cannot be disputed. Two years ago the very name of a five per cent. bond was looked upon by the investing public with disfavor. Compare, for example, the 1934 Victory, to which it is quite similar; these 5½ per cent. bonds in 1920 sold as low as 89; two years ago to-day they were quoted at 94½; a year ago, around 101 and to-day above 103. This movement is not due to the up and down fluctuation of the stock market nearly so much as it is to the gradual re-adjustment of the viewpoint of the investing public, resulting no doubt from the gradual allaying of our nervous fears and the establishment, in its place, of a greater confidence.

"Confidence" is the big thing—the word that means quite as much as "resources" in the near future of Canada. We can, if we think we can.

And, by the way, that applies to the coal situation in Central Canada. It is said that a fifty-car train carrying coal is on the way East from Alberta. If properly handled, this should cost the public around $13. At this price it will doubtless find ready sale in competition with U.S. anthracite at $15.50. Next summer we should have most of our coal supply in by this date. It seems inexcusable that three or four months have been lost this year.

Don't let us develop the habit of thinking that business is poor. There is full employment of labor at good wages; retail trade throughout Canada is better than average—considerably better on the average than a year ago; wholesale trade is about normal; there is no evidence of great accumulation of stocks either of raw materials or of finished products—everybody has been using caution; the crop reports say: "Best in history;" the banks had a better month in June this year than they had in May, or in June, 1922.

Prices are at a standstill. Labor is still fighting for higher wages—it is the biggest unfavorable factor in the whole situation.

It is possible that labor has it in its power to force a depression upon us. It is greatly to be hoped that common sense and self-interest will prevent them from doing it.

Refinements in Design Make Possible
Large Hydraulic Turbines

Indicating Great Advances in the Art—Increased Efficiency of Momentous Importance in Super Turbines—Improvement of Test Methods Another Step Forward

By H. G. ACRES, M. E., M. E. I. C.*
Chief Hydraulic Engineer, Hydro Elec. Power Commission of Ontario

On New Year's Day of 1905, in the plant of the Canadian Niagara Power Company, it fell to the writer's lot to bring up to speed, for the officials inspection of the Provincial Park Commissioners at Niagara Falls, Ontario, two 10,000 h.p. turbines, the largest units ever built up to that time. Seventeen years later, it was again the writer's privilege to turn over the first of the five 55,000 h.p. turbines now installed in the Queenston plant of the Hydro-electric Power Commission, at Niagara, the largest capacity units at present in operation. It was this more or less fortuitous combination of circumstances which suggested a subject for discussion.

Not in any sense as a precise definition, but for the purpose of placing a reasonable limit on the scope of discussion, a hydraulic turbine of large capacity may be defined as one having a capacity of not less than 25,000 h.p., and a revolving weight, with the generator, of not less than 200 tons, exclusive of hydraulic thrust.

The above limitation on capacity and revolving weight will serve the double purpose of eliminating from the discussion any consideration of low head installations, and at the same time giving prominence to certain problems which become increasingly serious as the operating head ranges upwards from 70 or 80 feet. As units of the class above defined are rarely installed under heads as low as this specified minimum, the discussion is therefore more or less limited to medium and high head plants.

Where a high operating head is involved, there is always present the problem of controlling high static pressure in the interests of safety; in most cases there is also the problem of controlling and utilizing the flow characteristics of long pipe lines to insure, not only safe, but practicable operation; finally where a copious water supply is associated with a high head, there enters the problem of safety and efficiency controlling a heavily energized water-column, and handling the immense revolving weight of the modern super-turbine.

Briefly, it may be stated that since the 10,000 h.p. prototype of the modern super-turbine went into operation at Niagara 18 years ago, the subsequent outstanding advances in the hydraulic art have been primarily in the direction of safer operation, not only from the personal standpoint of the operator, but from the impersonal, and hardly less important standpoint of the investor and the customer. Another point worth noting is that these advances had to do almost wholly with contemporaneous conditions, when they first materialized, and their possibilities as related to the present status of the art where more or less a matter of subsequent realization. In other words, these advances did not definitely anticipate the super-turbine, but their successful application to contemporaneous practice made its subsequent development technically and mechanically possible.

Static Pressure Control

Control of static pressure involved in super-turbine water supply is a vital factor in relation to a maximum degree of safety and convenience in aperation, and in continuity of plant output. Obviously the mechanism to exercise this function is a valve, and such a valve, for super-turbine service, must have the following general specifications:

(a)—It must be built in any size necessary to accommodate any conduit, however large.

(b)—It must be designed to operate under any static head however high.

(c)—Its operation must at all times be safe, sure and positive; in opening under full static pressure, and in closing under the most serious plant emergencies, such as the breakage of a wheel-case, or a runaway resulting from failure of governor control.

(d)—It must open and close rapidly, and should have an automatic closing feature to meet the abovementioned emergency conditions.

Obviously such a specification could not be met by any valve of the ordinary type, nor was it met until the advent of the Johnson automatic plunger valve. It is not within the scope of this article to enter into a detailed description of this valve and its operating principle, suffice to say that it is now an indispensible adjunct to super-turbine installation, and constitutes one of the advances in the general art which contributed to the possibility of present day super-turbine development. As it now stands, the Johnson valve is an adequate mechanism embodying the ideal elements of simplicity, efficiency and serviceability.

Flow Control

In the majority of cases the development of a high head involves the use of some type of closed pressure conduit of considerable length. In the case of an automatically governed plant where the ratio of head to length of conduit is more than about 1:10, certain phenomena become manifest which constitute a serious menace to safe and practicable operation. The continuous rejection and pulling on of load increments causes recurrent surges throughout the length of the conduit, which, if not damped out or relieved, will sometimes multiply and become superimposed to such an extent as to cause pressures enormously in excess of the static head. This condition, in conjunction with the conversion of pressure the velocity head for acceleration purposes, when a large increment of load is pulled on, will impose a duty on the governors which are not intended to perform, and where long closed conduits are used with turbines gated beyond the point of maximum efficiency, as they nearly always are, a condition may obtain which is entirely beyond the regulating function of the governor.

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*Before A. S. M. E. Convention in Montreal.

The power-discharge curve for the ordinary turbine will show a maximum production per second-foot at the point of best efficiency, and the first derivative of this curve will show a rapidly decreasing rate of production per second-foot from that point to full gate. Consequently, every horse-power pulled on in excess of best efficiency capacity will require a rapidly increasing amount of water to produce it. If therefore, the turbine is operating at or beyond the point of maximum efficiency, when the system demands a large increment of load, there will be a falling off in production per unit of water supplied and coincident therewith a loss of effective head, due to the absorption of such velocity head as is necessary to accelerate the water-column. During the period when the water-column is accelerating, it is therefore evident that a condition may obtain where the output is actually falling off while the water input is increasing, the result being that the governor may open the gates full-stroke in response to the falling speed, at which point its controlling function will cease until either the system "wr^2" holds the unit, with dropping frequency, for the space necessary for the governor to gradually resume control on rising speed, or until the generator drops its load and the turbine jumps to runaway speed at full gate, with possible disastrous consequences.

Insofar as the control of surge pressure is concerned, it is evident that if no practical limitations are placed upon it, in the matter of diameter and height, the ordinary standpipe would be an ideal corrective agency. It is clear, however, that in the case of a super-turbine installation, unrestricted scope in design is wholly impracticable from the standpoint of both cost and space limitation. On the other hand a simple standpipe, feasibly designed and located, may at times actually make more acute the conditions it is designed to correct or alleviate. This is due to the fact that the simple standpipe can only passively absorb surge pressure, with its recurrent phases, and for this reason often acts as an agency for superimposing, one upon the other, pressure waves generated by successive changes in load.

Another obvious expedient under this head is to limit the range of velocity change in the conduit by means of a synchronous by-pass, actuated by the governor mechanism. This contrivance can be adjusted to prevent the occurrence of disruptive pressures in the conduit, and also to supplement the influence of the system "wr^2" in holding the unit within the regular range of the governor when the unit is pulling on or rejecting load. In this connection it is to be noted that the condition under discussion has not necessarily to do with the maximum conduit velocity at any one time, but with range of change in conduit velocity over a short period of time, and with the absorption and building up of head energy induced by these changes, within their low and high limits.

The synchronous by-pass therefore has a useful function, but in the case of a high head super-turbine installation, its usefulness would be largely discounted by its cumbersome dimensions, its waste of water, and an added mechanical complexity which should be avoided whenever possible as a matter of principle.

The discussion under this head has now reached a stage where it is possible to define the specifications of an ideal surge control agency.

(a)—It should have the effectiveness of a simple standpipe of very large dimensions, without its cost and space requirements.

(b)—It should be capable on the one hand of preventing, or counteracting the effect of, any undue absorption of head energy when load is pulled on, and on the other hand of preventing or counteracting the effect of, any serious recurrent surge pressures arising from load rejections, whether isolated or successive.

(c)—The water surface should be sufficiently active to prevent freezing in ordinary low temperatures, and the dimensions should be such as to allow feasible and effective frost protection against extraordinary low temperatures.

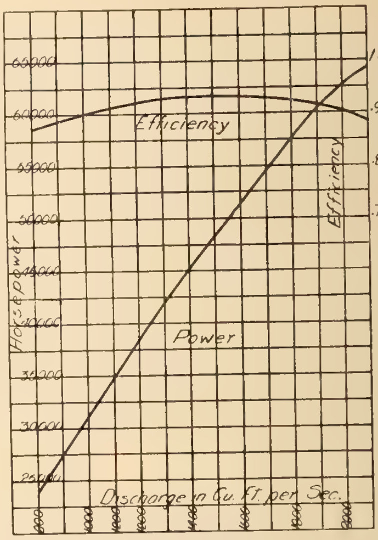

Fig. 1—Efficiency and power discharge curves for one of the Queenston turbines

(d)—It should operate without wasting water.

(e)—It should be mechanically simple, with a minimum of moving parts and adjustments.

(f)—It should be entirely dissociated from the governor mechanism, leaving the governor free to perform its own peculiar and highly important function, which is to control the speed of the generator, and not the vargaries of the water-column.

This specification has been met with a large degree of effectiveness by the most wholly original, and at the same time one of the most useful contrivances ever developed in the field of hydraulic engineering; namely, the Johnson differential surge tank. For those who are interested, ample published data are available concerning the structural details and operating principle of the Johnson surge tank, and for the purpose of this discussion it is only necessary to state that this contrivance constitutes another of the essential advances in the hydraulic art which have made possible the development and safe operation of the super-turbine.

Revolving Weights

The handling of the revolving weight of a modern super-turbine is governed largely by consideration of efficiency, a matter which will be discussed later, only the mechanical aspect of the problem being considered at this time.

The devlopment of the art under this head exemplifies a condition often met with in the field of engineering, where an inherently sound principle, after being supplied in a primitive way suffers a period of eclipse through arrested development, and perhaps years afterwards is rediscovered, and becomes the basis of the ultimate solution.

In the early days of hydraulic development the stepbearing, a form of combined thrust and guide bearing located under the runner, was used almost exclusively for support of the revolving element. The subsequent gradual increase in the efficiency, speed and capacity of turbine runners then began to introduce problems of pressure intensity, depreciation and accessibility, which the designers of that day solved, not by improving the step-bearing principle, but by abandoning it, and inaugurating, as a result, the era of the horizontal shaft-turbine. This led to advanced development in bearings of the pillow-brock type, together with the introduction of marine type thrust bearings to take up unbalanced runner thrust, a double requirement which gave rise to serious problems when the development of electrical generation and transmission called for continuously increasing turbine capacity and speed. The 20 000 h.p. horizontal turbines in the plant of the Ontario Power Company at Niagara Falls fairly represent the climax of this trend of development, with water-cooled pillow-block bearings of the enormous dimensions necessary to keep bearing pressure within safe limits, and rotor shafts having a diameter far in excess of torsional requirements, simply to minimize deflection.

The original turbines installed in 1896 by the Niagara Falls Power Company represent the first reversion to the primative basic principle. They were the super-turbines of that period, and were of the vertical shaft type. The revolving weight of these units was partially suspended from, and partially superimposed on a step-bearing located above the runner and immediately below the generator, thus removing one of the main disadvantages of this type of bearing, that of inaccessibility. A further important innovation was the application of external pressure to a film of oil which was forced in between the moving and stationary elements of the bearing. This oil was usually supplied by gear driven triplex plunger pumps at pressures varying from 80 to 350 lbs. per square inch, and maintained an oil film from two to four-thousands of an inch thick between the bearing discs.

The oil pressure thrust bearing had a vogue of many years' duration, and some bearings of this type are still in operation. Their disabilities are: expensive investment and maintenance cost, mechanical complexity, and high temperature, resulting in low oil viscosity and high energy. Also, even a momentary failure of the pressure oil supply usually results in the loss of the bearing.

Finally, there came the ultimate conception, based on the simple and true embodiment of a basic principle, first established by the experiments of Tower in 1883, and afterwards mathematically demonstrated by Reynolds. It remained for Kingsbury to exemplify this principle in a mechanism which is one of the most outstanding examples extant of the simple and efficient application of a natural law.

The Kingsbury type thrust bearing has the following characteristics which distinguish it from its oil-pressure prototype, and make it an eminently suitable mechanism for supporting, in motion, the revolving weight of the modern super-turbine.

It can be adapted to safely support the revolving weight of the heaviest turbine, within feasible dimensional limits.

The source of oil supply is static, and integral with the bearing itself.

The oil supply is "unlimited" in the sense necessary to conform with the laws of motion of viscous fluids, as ennunciated by Reynolds.

The formation of the "pressure wedge" is not induced by any external agency, but by the motion of the bearing itself, and by providing for a very slight lack of parallelism between the stationary and moving elements.

The wedge pressure is a direct function of the speed of the moving element, and the thickness of the oil film is a direct function of the degree of viscosity of the fluid, and consequently of fluid temperature, which can be regulated within any desired limits by the simple expedient of water-cooling coils.

In a recent action involving the Johnson valve, the trial just stated in the text of his decision that this valve was a "combination of elements beautiful in simplicity and highly efficient in operation." His observation applies with equal force to the Johnson surge tank and the Kingsbury thrust bearing, besides constituting a very concise general definition of the perfect mechanism.

Apart altogether from their very material contribution to operating efficiency, the mechanisms above discussed introduce a factor of safety and dependability, either singly or in combination, without which the present day status of super-turbine development would have been unattainable.

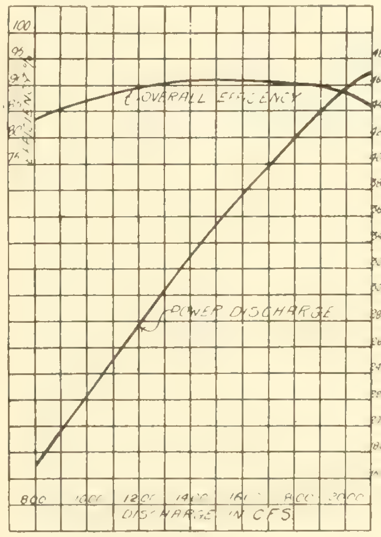

Fig. 2—Overall switchboard efficiency of a Queenston turbine

Refinements in Design

In classing the turbine governor under this head the question would naturally arise as to whether or not the governor should not be classed as an essential advance in the art, which, of course, it is. The point is that the items above classified as essential advances were radical departures from contemporary practice, and actually opened up the possibilities of super-turbine development, whereas the turbine governor was enlarged and improved more or less synchronously with the enlargement and improvement of the hydraulic turbine, and to meet the constantly increasing importance of the duty it was called upon to perform.

As the primary requirement of governor operation is precision and reliability, the natural trend of design has been in the direction of simplicity in principle, the reduction of lost motion by the use of a minimum of moving parts, and precise shop work. An interesting development along this line is the White shaft governor, where the centrifugal element is attached direct to the main turbine shaft, thus obviating the complication of a belt or gear drive for the fly-balls.

The double compensation principle, with the restoring mechanism and load limiting attachment, appears to meet all requirements of super-turbine control adequately and safely, and speed regulation is assured within safe operating limits for all gate movements up to the full stroke of the servomotors.

Remote switchboard control has also been developed to such a stage that there is considerable latitude as to the location of the actuator, which in some cases is now placed directly over the servomotor cylinders, in others on the machine room floor, and sometimes on the switchboard gallery.

A useful adaptation of the Johnson valve principle has been devised by Taylor for interchanging governor and hand control. Two sets of plunger valves are used, one set on the governor and one on the hand control, and the throwing over of one hand lever will simultaneously close all the governor valves, and open all the hand control valves, or vice-versa.

This operation can be carried out in such a short interval of time that there is little or no chance of losing control of the turbine, and no chance whatsoever of interfering with the proper sequence of operation.

One of the latest innovations in governor design is a motor driven centrifugal element, the motor being located in the fly-ball spindle, and synchronously actuated by the main generator. This device serves the same purpose as the shaft governor in that it eliminates the belt or gear drive.

The activity which has manifested itself during the last four or five years in draft-tube investigation is directly traceable to the vogue of the super-turbine. There are two main reasons for this; first, because the large concentration of power in a super-turbine permits an appreciable increment of useful power to be reclaimed as the result of a gain of only a fraction of a per cent in overall efficiency; and second, because vibration resulting from vortex action and unsteady vacuum becomes magnified in the super-turbine to such an extent as to often cause serious inconvenience in operation. The pioneer development under this head was the White hydraucone, which marked a distinct advance in this branch of the art.

Briefly, the two-fold object of recent draft-tube experimental research has been to regain as much as possible of the whirl component of the velocity head in the runner discharge, and to devise means of so training the combined axial and whirling flow, through appropriately designed water-passages, as to minimize conditions giving rise to vibratory effects. All experiments carried on along this line by the principal turbine builders have definitely proved the inadequacy of all forms of the elbow type tube, and have developed a series of types, more or less corelated which have given satisfactory results when tested under operating conditions. Of these types the Moody spreading tube seems to conform most nearly to one's conception of the condition to be met. This is particularly the case in respect of a cone in the centre of the Moody tube which extends from the invert to the lower extremity of the runner hub. Inasmuch as this cone solidly fills the region of maximum turbulence, it seems entirely reasonable to assume, even without experimental confirmation, that it will be effective in preventing cavitation, and the formation of vortices, with their resultant vibratory effects. Serving this purpose it also naturally follows that it must affect a useful conversion of the hitherto wasted whirl energy of the central zone, realizing thereby a gain in efficiency as well as a betterment in operating conditions.

In a small high head plant with which the writer had something to do, the turbine showed 85% efficiency on acceptance test. A year later the efficiency had dropped to 67% by reason of excessive leakage through the runner clearance spaces. The head in this case was 550 feet and the circhmference of the clearance spaces was about 14 feet. In the case of the 55,000 h.p. turbines at Queenston, the head is about 250 feet less, but the circumference of the runner clearances is about 65 feet. It is evident therefore, that in the case of a runner of this size, under such a head, the leakage factor is a serious matter. As a matter of fact, two of the most recent refinements in turbine design have been devised for the express purpose of meeting this condition; namely, the so-called "labyrinth seal" for preventing leakage through the runner clearance space, and the Overn disc for preventing leakage through the gate clearances.

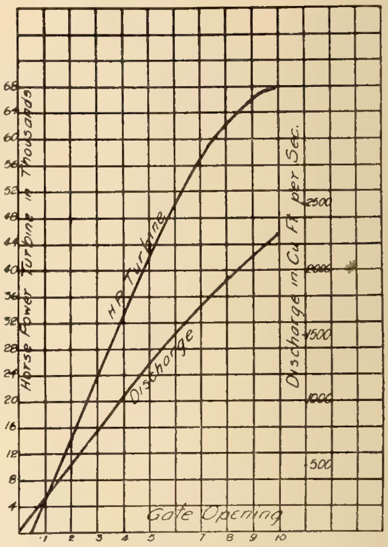

Fig. 3—Curve representing first derivative of the power discharge curve of a Queenston turbine

Instead of the ordinary simple seal consisting of a straight annular passage past the crown of the runner into the space under the head cover, and a similar passage past the runner-band into the draft-tube, the labyrinth seal consists of a series of alternately expanded and contracted passages which destroy the velocity head, and reduce the head on the final free jet to one-third of its initial value.

The Overn disc functions by introducing into the clearance space between the end of the gate veins and the distributor plates, an obstruction to the leakage flow, considerably greater than the diameter of the gate shanks,thus effectively reducing the leakage at these points.

Where the head is sufficiently high to require the use of a cast steel scroll case, a serious problem is introduced, having to do with the cantilever strain on the radial joints between the speed-ring and the scroll case. With the ordinary design, efficient bolt distribution is not practicable, and in the shop pressure test, where the scroll is not supported by a surrounding mass of concrete, the bolts are sometimes stressed beyond the elastic limit, with resultant serious leakage. This disability can be largely overcome by casting the speed-ring stay-vanes integral with the scroll sections, but the pouring and annealing of such a casting is most difficult and uncertain of result. The Taylor sectional scroll case is just as effective and largely removes any uncertainty as to the quality of the casting. Taylor's method is to cast the speed-ring stay-vanes integral with a small radial section only of the scroll, and connect later by means of a joint to the main section of the scroll. This joint is so located as to permit of a heavy flange and efficient bolt-spacing, and the castings are of such shape and dimensions that there is every assurance as to their quality after leaving the annealing furnace.

The showing made by the sectional scroll case under shop pressure test indicated that no undue risk would be involved in setting the scroll in the open, with only so much concrete as might be necessary to secure a stable anchorage.

With regard to the pitting and erosion of runners, it may be said that super-turbine development has now reached a stage where this condition is no longer primarily a problem of design, but of economics. In other words if the customer so specifies, the manufacturer can select a specific speed and supply, at a price, a turbine in which the runner will have as long a period of useful life as the other major elements of the installation.

Such a specification on the part of the customer would, of course, involve additional capital expenditure for the generator as well as for the turbine, but, as against this aspect of the situation it must be realized that the modern super-turbine frequency has a capacity which enables it to earn upwards of $2,500 every twenty-four hours. Consequently, the lost revenue charge against runner replacement, in a fully loaded unit, may easily run as high as $25,000.00. If this were necessary every two years, it would be equivalent, on a 6% basis, to a capital charge of $200,000.00. Such being the case, it is evident that the choice of a proper economic specific speed is a matter deserving the most careful and mature consideration, being a factor of at least equal importance with proper gateage, and elevation relative to tailwater.

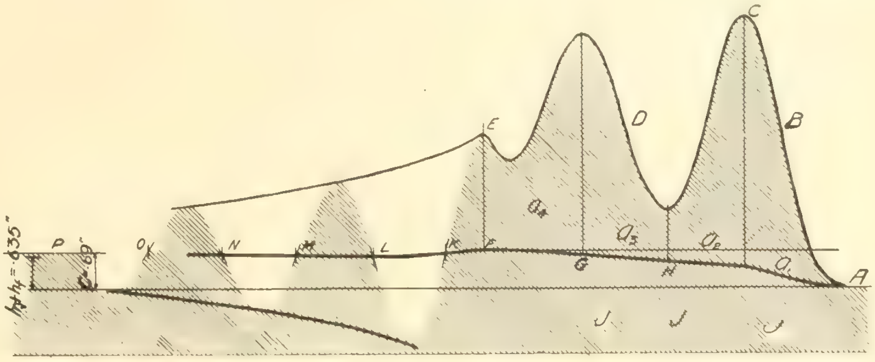

Fig. 4—A typical pressure-time diagram obtained by Gibson process.

Efficiency

The overall maximum efficiency of the Queenston units is well beyond 90%, and within their maximum efficiency range they deliver about 32 electrical horsepower to the switchboard for every scond-foot of water supplied under 305 feet of net head. Under such conditions a variation of one per cent, one way or the other, on one of these 55,000 h.p. units, would mean either the lack, or the availability, of sufficient power to meet the requirements of an average community of 2,000 population. This statement should serve to emphasize the significance of high efficiency as related to super-turbine practice.

The primary factor making for high efficiency is a minimum of obstruction to the direct flow of water from forebay to tail race. This consideration involves water passages of ample section, with changes in direction of flow eliminated wherever possible, and where unavoidable, careful proportioning and transitioning. These requirements constitute the general definition of high efficiency, and are exemplified in the carefully designed annular water passages in the Johnson valve, in the wheel-case, speed-ring, runner and draft-tube of the modern super-turbine, and also in the total elimination of one change in direction of flow entering the wheel-case, by vertically suspending the revolving weight from a Kingsbury type bearing. Secondary, but none the less significant factors, are the elimination of leakage, low power loss in thrust and guide bearings, and expert shop work.

The proper handling and co-relation of these various factors is exemplified in the results illustrated in Figure 1, which shows the efficiency and power-discharge curve for one of the Queenston turbines. The matters of interest in connection with these curves are as follows:

(1)—The maximum efficiency is 93½%.

(2)—The efficiency at the point of maximum discharge is 88%.

(3)—The turbine has a capacity range of 32,000 to 63,000 horse-power at efficiencies of 90%, or over, and a capacity of 37,000 to 60,000 horse-power at efficiencies of 92% or over.

Figure II illustrates the overall switchboard efficiency curve of the same unit, and indicates a maximum overall efficiency of 91%.

The outstanding fact in connection with these results is that the modern super-turbine is capable of converting into mechanical energy all but 7% of the gross potentiality of the water supplied. Extreme conservation in the fixing of specific speed, and the combined effect of further small refinements in the design of water passages, may possibly raise this efficiency another per cent in the future, and may give the curve a slightly more advantageous shape, but it would really appear that the super-turbine of the present day embodies the ultimate in respect of water economy at the point of best efficiency.

Figure III is an interesting curve representing the first derivative of the power-discharge curve of one of the Queenston turbines.

As its name implies, this curve is derived by plotting the amounts of horse-power per second-foot produced, in various regions of gate opening at and beyond the point of maximum efficiency, by a very small opening movement of the gates. In other words it shows, not the gain, but the rate of gain in power for increasing water input.

It will be seen that when operating at the point of maximum efficiency with a water input of 1,600 second-feet, the gain in power for one additional second-foot supplied is 32 horse-power. On the other hand, at full gate, when the turbine is taking water to the extreme limit of gate-opening, the gain in power for one additional second-foot supplied is only about 10.5 horse-power.

The two extremes above cited serve to illustrate the significance of previous statements made under the head of flow control and also to confirm the truth of the following statement: that under high heads, where the gross potentiality per second-foot of water is correspondingly great, it is in the best interests of economy, as well as safety, to operate normally at the point of best efficiency, and to employ the excess capacity of an over-gated turbine for emergency purposes only, and for routine operation. This statement has an added significance, also when the water supply is artificially stored.

Furthermore, it is obvious that as the point of maximum efficiency is also the point of minimum hydraulic loss, the rate of runner deterioration at this point must also be a minimum. From this point on, the rate of runner deterioration is an accelerating progression, directly related to the degree of over-gate.

The points in favor of gating the super-turbine back to the point of best efficiency are: first, safe and efficient operation, particularly where long pressure conduits are involved; second, economy in the use of water under high heads, where the gross potentiality per second-foot of water is great, and where artificial storage is a factor; and third, on account of runner deterioration, particularly where runner replacement involves a material revenue loss.

The matter of turbine gateage has not, in the past, received the attention it deserves at the hands of the purchaser. It does not particularly interest the manufacturer, and must be covered, if at all by the customer's specifications.

It would also appear that the main factor offsetting the above argument is one of cost, and not of engineering; namely, the additional cost, if any, of providing emergency plant capacity in the form of a seperately installed unit or units, instead or relying on the over-gate capacity of the normal installation.

It may be stated in conclusion that generalizations have probably less weight in hydraulic work than in any other branch of engineering, as nearly every prospective installation is an unique problem in itself, and no class of construction work is less governed by precedent.

Test Methods

The factors entering into a turbine test are forebay and tail-water level measurements, net head measurements, records of gate-opening, and measurements of power flow.

Most of these factors are susceptible of easy and accurate determination by well established methods, but in the case of flow, the immense quantity of water taken by the modern super-turbine introduces an almost unsurmountable problem as regards accurate measurement by ordinary means. It so happens, however, that there has recently been devised a method of flow measurement in closed pressure conduits, which by reason of its accuracy, cheap application, and conformity to an established principle of natural law, entitled it to be classed among the essential advances in the hydraulic art, as related to super-turbine practice.

This method of flow measurement, known as the Gibson Process is based in principle upon Newton's second law of motion, and upon the less generally known theorem of Joukovsky, which is to the effect, that when the velocity of flow in a clossed pressure conduit is retarded, an oscillatory wave is induced, the intensity and amplitude of which is proportional to the degree of retardation, and to the duration of the period over which the retarding influence acts. Briefly, Gibson used the penstock and turbine gates to produce the Joukovsky pressure wave, which he recorded graphically with an apparatus of his own devising, and then reduced the result by the mathematical process of Newton's second law.

The method is therefore almost unique in the field of practical hydraulics, in that it involves no empirical constants whatever, and the mathematical accuracy of the results is limited only by a relatively small instrumental and personal error involved in graphically recording and measuring the pressure wave.

The Gibson process has been fully described in the technical press, and it is not the intention here to cover the details of its theory or application. It may not be amiss, however, to describe briefly, the unique and interesting method of obtaining and using the "pressure-time" diagram which forms the basis of computation.

The recording apparatus consists of a mercury U tube connected to the penstock through a one-quarter inch pipe. The glass leg of this U tube is connected to a camera box containing a lens focusing on a light-proof cylinder, the latter carrying a sensitized film and revolving at constant speed behind an oscillating seconds pendulum. When gate closure occurs, the mercury column in front of the lens rises and falls with the pressure wave, and the record is printed on the revolving film. At the same time, the stem of the second pendulum, swinging across the face of the lens, records the time period of gate closure on the film, in the form of a vertical black line.

Figure IV illustrates a typical pressure-time diagram thus obtained. The point "A" represents balanced conditions in the system just previous to gate closure. The distance from "A" to the vertical line "EF" represents the full time period of gate closure. The oscillations to the left of the line "EF" are due to the mercury column gradually stabilizing by friction, until at the point "P" static head is registered, with the penstock water column at rest. The vertical distance between the point "A" and the point "P" therefore represents, to the scale of the diagram, the recovery of velocity and friction head. The lines "J" represent the second intervals recorded by the pendulum.

The total area above the base line, and to the point of gate closure at "F," represents a total energy absorption containing three separate elements, velocity head, friction head, and the destroyed momentum of the water column, This latter element being the one required for the application of Newton's second law, it follows that the energy absorption due to recovery of velocity and friction head must be segregated.

At the point "A" it is evident that the full value of velocity and friction head is existent, while it is equally obvious that "F," the point of final gate closure, this energy has been fully recovered. The line AHGF, technically known as the "recovery line" divides the total energy area into two parts, the upper part of which A,B,C,D,E,F,G,H, represents the value sought, namely, the destroyed momentum of the water-column. The area below the recovery line of course represents the sum of the other two elements, friction and velocity head. Intermediate points between "A" and "P" on this line are obtainable through the fact that the area generated at the end of any partial period of gate closure is proportional to the amount of flow reduction at that point, and also that the velocity and friction heads still unabsorbed are proportional to the square of the residual flow. The intermediate points "C" and "H" were determined on the basis of these relationships, through the medium of the measured sub-areas A1. A2, A3, and A4.

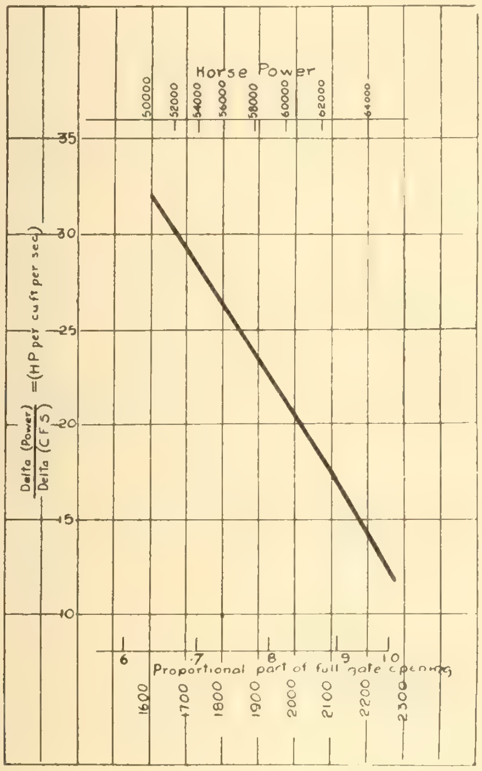

Fig. 5—Gate opening power and gate opening discharge curve for one of the Queenston Units

Figure V illustrates a gate-opening power and a gate-opening-discharge curve for one of the Queenston units. These curves are interesting in that they were compiled on the basis of two simultaneous but entirely independent series of measurements, in different sections of the penstock, by the Gibson process. The round dots on the curve represent the determination of Mr. Gobson himself, with his own assistants, and the triangular dot represent the determinations of the engineers of the Hydro-electric Power Commission. The close agreement of these two series of discharge measurements affords striking evidence of the remarkable consistency and precision of the Gibson method of discharge measurement.

This test, with all the other necessary operations in connection with head and gate-opening measurement, etc., was made complete within about four and one-half hours, and included 28 separate runs at various gate openings, an average of ten minutes per run. The unit itself was out of commerical operation for about one hour altogether, showing clearly the facility and cheapness with which the Gibson test can be carried out.

An interesting feature of these tests manifested itself in an apparent inconsistency in some of the finally computed points for the efficiency curve, which varied for equal power outputs. This trouble was due to a discrepancy in the power readings, which were actually correct in themselves within the error limits of laboratory standards. The reason is that under the Gibson method the velocity measured is that existing at the instant the gates begin to move, and if the speed of the unit is perfectly uniform at this instant, the corresponding power reading will be correct for the measured discharge. If, however, at the instant of the flow measurement, the unit is in process of a speed change even so small as to be unnoticed on the frequency meter or tachometer, an error will be introduced in the electrical power measurement which the Gibson process is sufficiently precise to detect.

The fly-wheel effect of the Queenston generators is 21,000,000 foot-pounds squared. If, at the instant of a flow determination, the speed of the unit is dropping at even so small a rate as one cycle in ten seconds, there is 570 horse-power resistered on the wattmeters which the "wr^2" of the generator is supplying, but not the water as measured .

Conversely, if the speed of the unit is in process of increase at the rate of one cycle in ten seconds, there is 570 h.p. which is not being registered on the wattmeters, but which the water, as measured, is actually supplying, for absorption by the generator "wr^2."

This means that for any one value of discharge there may be any number of watt-meter measurements which may possibly be in error in any amount up to 1,000 horse-power. It is possible that this disability may be overcome by devising some simple means of recording the minute speed change of the unit synchronously with the instant of flow measurement, and thus permit a proper correction to be applied to the power readings.

The use of the Gibson process is naturally limited to conditions which are properly conductive to the production of the phenomena upon which the theory is based, the first essential being a closed pressure conduit of reasonable length and uniform section. In short conduits of say 50 to 60 feet in length, more especially if they have at the same time a non-uniform section, it becomes necessary to apply correction factors which have a greater relative influence on the ultimate accuracy of the result than is the case with long conduits of uniform section. It so happens, however, that the recently devised Allen "salt-velocity" method of measuring flow is susceptible of application to short as well as long conduits and to non- uniform as well as uniform sections, the accuracy of the final result being dependent, not upon an instantaneous pressure rise, but on the refinement of method and money outlay applied to the injection of a salt solution, the time of passage of which, through a fixed length of conduit, forms the basis of the final computation.

Correct Subgrade Design Effects Saving in Road Construction

Strengthening Road Surface Will Not Correct Sub-grade Weaknesses—Steps Taken Towards Standardization of Design—The Question of Pipe Drains.

The committee on sub-grade and its relation to road surfacing and traffic, of the Federal Highway Council has brought in a progress report. The committee bases its findings on experience in the United States over a wide area. In their opinion road building is now reaching its rightful place, etc.

Road building is now reaching its rightful place in scientific development, where the design and construction of the subgrade and foundation are commanding nearly as much attention as the design and construction of the surface. Considerable economc waste has been caused by trying to correct subgrade weaknesses by strengthening the road surface. This method has proved so conclusively wrong that much experimentation and serious study have been and are being given to design and construction of a proper subgrade.

While road surfaces on account of their characteristics are divided into standard groups, subgrade conditions are so variable and characteristics so numerous that little has been done to group or standardize subgrade designs, other than to outline a few methods of treatment—all leading in the direction of stabilizing and increasing the bearing power of the subgrade material.

It is impractical at this time, on account of the variety of conditions, to specify details of subgrade construction, yet a few facts in connection with subgrade design may be conclusively stated, viz:

1. The bearing power of nearly all soils is increased when the moisture content is decreased.
2. The bearing power is affected by moisture in some soils more than in others.

Theerfore, the first two principles in the design of subgrades are the regulation or exclusion of water and the selection of a subgrade soil or material that has the highest bearing power and is least affected by moisture.

Subgrade design has for a long time been masking under the name of drainage, and in many instances the installation of pipe underdrains has been considered a cure-all, regardless of whether or not the subgrade was a drainable soil or material that would be bettered by the installation of such drain pipes.

The bearing power of practically all soils is affected by moisture, so that in designing the subgrade it is necessary to see that the material that is least affected by moisture is used. Some soils expand greatly on taking up water and shrink upon that water drying out; this effect of water proves the soil to be unstable and unsuitable for subgrades. The accompanying charts show how the addition of the same amount of water affects various soils differnetly, and clearly demonstrate that in selecting soil for subgrades, it is desirable to select a material that will have a high bearing value, even though it has become saturated with water. Generally speaking, the coarser the material up to a certain practical size for working, the less capillary saturation and the greater the bearing power. From the figure it is shown there is no exception in the soils but cinders prove to be an exception.

Experiments have shown that a layer of coarse material such as sand or gravel, when placed over clay, retards the capillary water from rising to the top of the subgrade, or in the case of soil roads, to the top of the surface; from which it may be seen that the value of the design of the subgrade not only depends on the regulation of moisture but the selection of the subgrade material as well.

Any system of drainage that will prevent water from finding its way to the subgrade will also serve as a means of freeing the subgrade of the water that does by chance find its way to it. Generally this is found in the selection of subgrade material and a combination of ditches and underdrains. Care should be taken that the ditches are only of a sufficient depth to lower the water table and are located far enough from the traveled way to interpose no hazard to traffic.

If side or longitudinal ditches are designed properly it seldom happens that longitudinal pipe underdrains are necessary, for the open side ditch will perform all the drainage functions of such drains.

Pipe Drains

Oftentimes these longitudinal pipe underdrains are constructed beneath the roadway surface, but it is better to construct the pipe drain outside, for then it can be repaired if necessary without disturbing the road surface. Should pools of water accumulate due to sagging of drain pipe line or should it become clogged, the stability of the subgrade in the immediate vicinity would be greatly reduced. This condition occurring in a pipe line placed under the road surface would reduce the supporting value of the subgrade to the surface slab.

Lateral pipe drains placed at angles with the longitudinal ditch or pipe drains are sometimes necessary to take care of springs, saturated soil or other sources of water. The number of such lateral drains depends on the nature of the soil drained; the character of the subgrade material largely controls their number and the location. The more impervious the soil the greater the number of drains necessary to drain the subgrade.

In certain soils, pipe underdrains are pracically valueless, as the rate of flow through the impervious material is so slow that the water does not find its way quickly to the pipe and thus keeps the subgrade saturated and of a low bearing value. In other soils through which water will more quickly drain, pipe underdrains are more effective, and as the soil becomes more drainable the subgrade becomes more responsive to the use of underdrains, but the necessity of underdrains becomes less.

In impervious soil, pipe underdrains drain only the soil in their immediate vicinity. The impervious soil prevents percolation of water from the under surface of the roadway to the pipe. Soil underlying the surface slab, being saturated, its bearing value is consequently reduced to a minimum.

Most typical road sections carry a side ditch, the bottom of which is below the top of the subgrade. This ditch is sometimes replaced by a drain, but in either event the purpose is to cut off or intercept any water from reaching the subgrade, as well as to act as a drain or sewer to carry off the water. The side ditch also serves as a connection or sewer to carry off any water from the lateral drains.

The question of choosing between open side ditches or pipe underdrains for the disposal of water is one of service and cost combined. It is both difficult and costly to keep the open ditches free from obstruction of ice or earth slides and in a condition to function all the time. Whether it is more economical to install pipe drains or run the risk of soaking the subgrade and greatly impairing the road improvement is a problem to be met with sound judgment, giving weight to the value of constant service and cost of maintenance, as well as to safety in the operation of traffic.

Hard surface roads practically waterproof or protect from rain the subgrade below the surface. Selected soil roads approach this condition, though in a lesser degree. This is especially true if the water running off the road surface over the shoulder is drained away from the subgrade toward the ditch. Thus we see that the road surface and side ditches protect the subgrade from water from the top and sides but it is not protected from capillary moisture from the bottom which in many soils exists in quantities sufficient to greatly decrease their bearing power and thus weaken the subgrade. It is very difficult to cope wth the water rising by capillarity and many times this causes failure of the road surface.

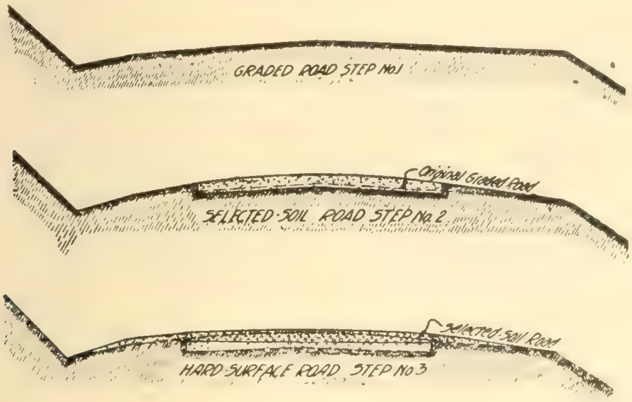

Fig. 1—Showing different steps in subgrade highway construction

Underdrains in most soils will relieve the ground of free water, but recent research in this field has shown conclusively that underdrains will not take care of capillary water. The ditches and underdrains may be designed to adequately cope with the surface water and water from springs and other sources, yet capillary water may be present in sufficient quantity to decrease the stability of the subgrade to such extent that it must be cared for.

Assuming that surface water may be cared for by ditches, and that water in the subgrade from springs and other sources may be relieved by underdrains and ditches, the problem of caring for capillary water still remains. The most satisfactory way to cut off capillary water is to introduce a layer of material of low capillary value, or, in other words, a material through which the passage of the capillary water will be retarded. This can often be accomplished by selecting in the grading of the road, material of low capillarity and using it for a subgrade on which will rest the hard surface, or in the case of soil roads, that portion used by traffic. It often happens that it is more economical to borrow material, the bearing value of which is least affected by water, for the subgrade, and it sometimes may be desirable to waste materials from cuts, and borrow satisfactory material for the fills. Too much stress has been laid on the balancing of quantities and too little stress has been laid on the selecting of material entering the subgrade.

Much experimentation is now being carried on to find a method of changing subgrade materials of high capillarity and of low bearing value into materials of low capillarity and high bearing value. Treatments of clay with tars, lime and other ingredients are being tried, but it is safe to say that no method to date has proved as economical and sure as replacing high capillarity and low bearing subgrade material with another material of known lower capillarity and higher bearing power. The construction of this type of subgrade may seem costly, but when it is considered that the increased bearing power of the soil will, with less expensive surface, carry heavier loads, or with the same surface will last much longer, it can be seen that there is an economic balance in favor of the properly designed subgrade.

In the construction of a road system, it is possible in many cases to build a progressive type road, which is another way of stabilizing successive subgrades and eventually arriving at the hard surface pavement.

The graded road, step No. 1, shows first step in subgrade highway construction and is maintained as such until settlement is complete, or until increased traffic and high cost of maintenance indicate the necessity of the next higher type.

The nature of the soil should determine the character and extent of the drainage system. With a drainable pervious material one system might prove adequate, whereas the same system in an impervious soil would be absolutely worthless.

The selected soil road, step No. 2, shows surface covered with selected soil, such as sand clay, topsoil or gravel, thus stabilizing the surface and providing material of higher bearing value. This surface is then maintained as a subgrade highway until maintenance becomes heavy or traffic demands a hard surface road.

The hard surface road, step No. 3, is the final step, the ultimate road. The hard surface is so placed that the selected material of the underlying selected soil road which has been serving as a subgrade highway, now becomes a subgrade stabilizer for the hard surface road, greatly increasing its bearing power and assuring an adequate subgrade.

In the progressive type of road all steps taken in its construction include the utilization of the previous construction in transforming to the next higher type, and each step may be considered as a subgrade for the next type. This often justifies the expenditure of sufficient money to select soils of a character that may, with proper maintenance, be used as a surface material until such time as the traffic demands or the cost of maintenance makes it necessary to construct

(Concluded on page 753)

A Modern Sewage and Purification Works

Designed for an Ultimate Population of 650,000 Persons—Total Capital Expenditure £1,750,000—Supply of Water Derived by Impounding on Moorland

The City of Leeds, England has in course of erection a modern sewage purification works, which has been in course of construction some ten or twelve years. Mr. George A. Hart, sewage engineer of that city, read an interesting paper a few days ago at the Annual Meeting of the Institute of Municipal and County Engineers, in which he described the new works, so far as they had been constructed, and outlined some of the difficulties that were being met with. The crude sewage of Leeds is stated to have the following characteristics:

The supply of water is derived from the impounding of water collected on moorlands of the carboniferous period. In quality the water is soft, the total hardness being about 5 parts per 100,000. The whole of the sewers are designed and operated on the combined system. The whole of the population practically now use the water carriage system. Contributors of trade waste using grease and soap solutions to any marked extent, and whose crude effluents contain high percentages of solid matter, are required to remove wherever practicable the crude grease and grosses solid matters to a normal extent, and also to regulate their discharges into the sewers with some regard in proportion to the rate of flow throughout the twenty-four hours. The chief trades contributing to liquid trade wastes are the woollen, textile, dying and cloth-finishing industries, tanneries and breweries, oil, soap and tallow works. The flow from the trades indicated constitutes about 20 per cent of the total flow of sewage. The total trade effluent flow amounts to 35 per cent of the daily dry weather flow.

The New Works

The main sewage works extensions authorized by the Act of 1908 at Thrope Stapleton were designed to meet a requirement of an ultimate population of 650,000 persons computed upon an estimated dry weather flow of sewage of 40 gallons per head, or 26 million gallons per day; 25 gallons per head were for domestic purposes and 15 gallons for trades flow.

Sewage screening machinery and detritus pit accomodation of about 1-50th the dry weather flow capacity, followed by settlement in rontinous flow sewage tanks equal to a period of sedimentation of eighteen hours on the dry weather flow basis, is embodied in the scheme, the tank effluent subsequently receiving secondary treatment upon percolating filters for the dry weather flow of sewage, and which in time of rainfall will receive full and complete treatment by the same process to the extent of 92 gallons per head of the population, or 2 1/3 times the estimated dry weather flow.

There appears to be every probability that the original estimate of £1,277,000 will be exceeded by a further £500,000, making the total capital expenditure upon the scheme in a further five years—say, 1928—when the works are estimated to be completed, for the sewage disposal works and main sewers about £1,750,000.

Two outstanding difficulties necessitating special engineering construction have arisen during the eight years, and when the conditions disclosed themselves they have necessitated a reconsideration of the design in order to overcome the obstacles presented.

Troubles From Land Subsidence

The difficulties consisted of the peculiar conditions under which subsidence from shallow coal workings had taken place on the site upon which the new high level main sewage tanks are constructed. It was known that the prospective site of these tanks coincided with the site upon which the Middleton coal seam approximately outcropped.

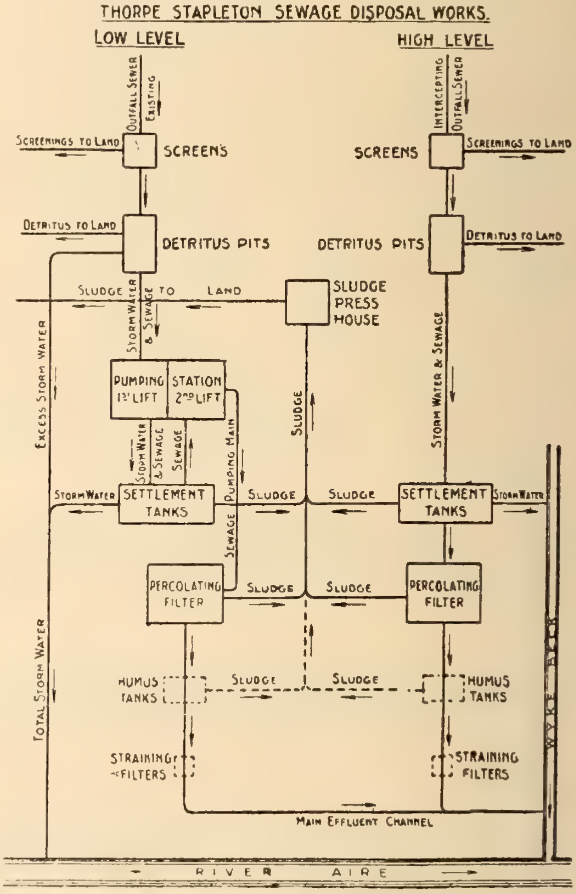

Fig. 1—Layout of Works

A number of trial holes of substantial size were sunk prior to the commencement of operations down to a level coinciding with the new floors of the prospective tanks. A layer of flagged stone of 18 in. to 24 in. in thickness was exposed in the trial hole excavations, the measures dipping in a southeasterly direction. The fall in the floors of the tanks was from east to west.

When the general excavation had been largely completed on the site of the tanks preparatory to the commencement in trenches for the foundations of the side of the walls and main culverts, it was discovered that the stone band referred to had been of sufficient strength when buried in the ground from 10 to 12 ft. below the original surface to carry the whole of the superimposed weight of earth above it without any indication of fracture, and without apparantly giving any indication that any subsidence had taken place in consequence of the working of coal on the old pillar-and-stall system, which was known to have taken place about thirty years previously.

Unfortunately, the stone band was proved to be resting upon the cone-shaped pinnacles of the ground formed by the subsidence, varying from a foot to 3 ft., caused by the extraction of the coal in between the pillars; and where coal had been worked, including the pillars themselves, the natural ground, which consisted of thin laminated shale, was cracked and distorted to an extent which necessitated complete close timbering in all the foundation trenches.

The necessary level of the tank floors over the greater portion of the area of the site necessitated the complete cutting away of the stone band, and when the stone band was cut into the resulting weakness from that operation caused it to break up by a series of small cannonades.

In order to obtain a safe foundation for the tank walls and culverts it was ultimately decided to adopt the following method of construction—viz., to sink piers down from the base of the tank walls and culverts down to the level of the bed of the coal seam which had been abstracted, and to form concrete arches below the level of the tank wall foundations to support the walls. This operation delayed the completion of the high-level tanks by twelve months. At the south-east extremity of the tanks the piers are sunk for a depth of 30 ft., and at the western end the depth is reduced to about 12 ft. The space in between the floors forming the side walls of the tanks was in places levelled up with stone packing, and the concrete floors were constructed in mass concrete 12 in. in thickness, wedded into the broken stone filling. The floors are not bonded into the side walls, but on an even bed upon the pillars existing below.

A Flood Water Difficulty

The second difficulty has been of a much more formidable and intricate character, and concerns the nature of the ground upon which the new sewage settlement tanks on the low-level site at Knostrop require to be constructed. The site is bounded upon two sides by the River Aire. The river is weired at two points near the site. The bed of the river consists of alluvial mud overlying a bed of large glacial drift gravel, and intersected with beds of sand. Between the sewage works site and the river there is an earthen embankment, which in its upper portion forms an embankment against flooding from the river.

The natural surface of the site of the tank foundations—ground level—is about 4 ft. above the level of the bed of the river. The normal depth of water in the river, as governed by the weir, is about 6 ft.—that is to say, the normal river level is about 2 ft. above the level of the ground on the site of the tanks to be constructed. In time of flood the water in the river may rise a further 10 ft. in exceptional cases The bed of gravel which traverses underneath the river allows the river water to travel underneath the flood embankment, and enter upon the sewage works site. A bed of sand saturated with water overlies the gravel from a depth of 3 ft. to 4 ft. On the top of the running sand there is a depth of clay mixed with sand.

It was regarded as prohibitively expensive to contemplate any method of pumping for the purpose of securing a foundation to build upon. The whole site of the tanks, in fact, being saturated with water connecting itself from the river. When the site is ultimately filled up with the tankage, it is probable that the saturation level of standing water on the site will be materially increased in consequence of the constructional operations.

Having regard to the very serious difficulties which the site presented, the advice of Mr. Basil Mott, C.B., M. INST.C.E., was taken upon the writer's proposal for dealing with the problem,and it was ultimately decided that the most economical method for securing a thoroughly satisfactory foundation for these tanks was to make reinforced concrete cylinders, and sink them down to the level of the top of the gravel in sections, 5 ft., 4 ft., 3 ft. and 2 ft. respectively in depth, and to anchor down a strong reinforced concrete floor 2 ft. in thickness into the concrete filling of the cylinders to form the floors of the new tanks, the side and end walls of the channels resting upon cylinders spaced for that purpose.

This method is being adopted, and the foundations are now in progress of construction development. The cylinders are 9 ft. external diameter, 6 in. in thickness, reinforced with expanded metal and concentric rods, and are arranged in a chess-board design, their centres being placed at intervals of about 24 ft.

The cylinders are being manufactured by the contractors on the site, and are lifted and sunk by a special sinking machine constructed for the purpose. When this construction has been completed the new sewage tanks on the low-level site can be proceeded with.

The floor reinforcement will be arranged so that the maximum effect of the load on the floor is transmitted along the shortest line and its nearest support, and the unavoidable concentration of reinforcement over the cylinders by the interweaving of the measure of reinforcement will be utilized to take the double tension due to the end fixings at the cylinders.

When the tanks are full to their maximum water level—with a corresponding minimum level of surrounding infiltration water—it is calculated that a pressure due to water of 9 ft. head will prevail after construction. When the tanks are empty, with a maximum infiltration water level prevailing after construction, there will be a head of 7 ft. of water operating against the underside of the concrete floors of the tanks.

The total estimated cost of constructing and sinking the cylinders and reinforcing concrete floors forming the foundation system amounts to £100,000 based upon 1921 cost of labor and materials, and the method of construction adopted was estimated to represent a saving of about £115,000, which would otherwise require to have been spent by the adoption of any other satisfactory method of overcoming the peculiar difficulties.

A company to be known as "The Weston Theatres Limited" has been formed at Weston, and it is said that work will soon commence upon the erection of a sixty thousand dollar theatre. Thos. Moorehead, of Brampton, is president of the company; M. J. Seal, Weston, is secretary.

Elimination of Highway Abuses

Many Evils Customarily Precede Completion—Tendencies Arising From Our System of Road Building—Abuse After Completion Cannot be Controlled by Law Alone

By THOMAS J. WASSER *
Late Highway Engineer of New Jersey

Often the greatest abuse that comes to our highways occurs prior to completion. Failure to finance wisely, faulty judgment as to type and width of pavement and choice of location to suit certain interests are common abuses of the highway before it is built. In detail some of the items are:

1. Making the term of bonds longer than the life of a pavement.

2. Failure on the part of the engineer to provide a design and type of construction to meet the requirements of modern traffic.

3. Faulty construction on the part of the contractor for personal profit.

4. Inefficient inspection due to lack of knowledge, and to insufficient salary being paid to attract capable men.

5. Acceptance of inferior work.

6. Permitting inferior material to be substituted for that specified when delays are brought about by conditions beyond the control of the contractor.

7. Sacrificing quality for speed.

8. Failure to provide for a satisfactory well marked and maintained detour during the period the highway is under construction.

9. Designing and building bridges for a live load less than that for which motor vehicles are licensed and narrower than the graded width of the highway.

10. Failure to provide for the elimination of railroad grade crossings.

11. Designing underpasses with a head room less than 14 ft. in the clear.

12. Lack of co-operation on the part of public utility companies and municipalities. The highway departments should advise all interested utility companies and municipalities as soon as a highway project is decided upon, and these interested parties should immediately proceed to perform all necessary sub-surface work thereby eliminating delay in the progress of construction and the necessity for opening the pavement in the near future.

13. Absence of caution on the part of bonding companies. Bonding companies becoming surety for inexperienced persons who are operating under the guise of contractors or construction companies jeopardize the interest of the State engaged in highway construction. They should limit the surety to a fixed amount for the first contract, increasing the surety on the second contract, and so on until the applicant establishes his responsibility for carrying out contracts of magnitude.

14. The tendency of contractors to bid too low. This fault has had more to do with the performance of inferior work than any one other cause, and inexperienced contractors just entering highway construction are chiefly responsible, yet the bonding companies will go on their surety just the same as they will for experienced contractors.

15. Use of inferior material. Competition in manufacturing or producing material used in connection is such that inferior material is frequently put in competition with satisfactory material, and by under selling is used in the work. In many cases where inferior material has been rejected by engineers and officials they have been charged with favoring some particular material or product for reasons other than its merits.

16. It has been definitely determined that excessive use of water in mixing injures the quality of concrete, yet in many cases engineers, contractors and inspectors still permit the use of excess water. The contractor permits it because his force can turn out more work, and he claims it is just as good. The inspector tries to remedy matters, but is unsuccessful. The chief engineer cannot see all the work, and a subordinate in carrying out his chief's desires is accused of retarding the progress of the work. However, anything that tends to add unnecessary cost to the contsruction and maintenance of the highway should be considered an abuse just as much as should a violation of the provisions set down to protect it.

All of these abuses should be corrected at once, and the industry protected by the soundest kind of financing, engineering design, faithful construction and efficient inspection.

Abuse of the highways after completion is generally caused by a small percentage of users. Such abuse frequently results in accidents, causing injury and loss of life and destruction of property. Law enforcement alone will not overcome these conditions or decrease the number of traffic accidents. The problem requires: first, adequate traffic planning, and second, proper enforcement of regulation according to the plan.

In order to enable those whose duty it may become to work out an equitable and uniform plan to prevent the abuse of the highways, the writer recommends:

1. That the minimum width of all main highways be not less than 30 ft. and (a) That this graded width be kept clear of all encroachments, and (b) That all traffic rules be made uniform.

2. That a system of marking one-way streets be adopted, which will be uniform as to type and location of the markers.

3. That it is desirable to standardize all directionary and cautionary signs as to color and marking, and that posting signs other than directionary and cautionary on the right of way be made unlawful, and subject to a fine for each offense.

4. That the erection of signs on property abutting on the highway at curves, railroad crossings and in-

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*Before American Road Builders' Association.

tersections be discontinued, where such signs would obstruct the view of those using the highway.

5. That it is desirable to standardize colors to be used for degree of danger where illuminated signs are used, for instance, red at a railroad crossing or dead ends of highways, green for highway intersections, and amber for grades and curves.

6. That a uniform traffic regulation be adopted for intersecting highways to be in affect in the absence of traffic officers.

7. That a uniform maximum height, width, and length of vehicle be adopted.

8. That a uniform gross weight of vehicle and load for each class of commercial motor vehicle be established.

9. That all gas filling stations be located on property abutting on the highways, and not on the right of way; and that all gas filling stations shall display a visible tag on each pump, which shall be placed there by the State Department of Weights and Measures certifying as to the accuracy of said measuring device.

10. That parking of vehicles on both sides of a highway opposite each other, where a minimum distance of 20 ft. between the vehicles is not provided, be considered a nuisance and be made punishable by a fine.

11. That the erection of all booths and stands for the sale of goods within the right of way, and displaying farm produce in containers within the right of way be prohibited, and that the use of vehicles for retailing wares along the highway where such practice would cause persons to congregate on the paved portion be also prohibited.

12. That a uniform penalty for operating a defective motor vehicle on the highway should be provided. It is not the purpose of this paper, nor is the writer qualified to discuss automobile design; however, there is a common defect particularly in trucks, the correction of which would eliminate one source of danger. Tail lamps frequently fail to function due to the wires having been damaged by abrasion or exposure to splashing water. It would seem to be an easy matter for the designer to provide protection for these wires. Other defects that the writer has in mind are broken or improperly adjusted brakes and badly worn tires.

13. That legislation be enacted to provide against motorists running past barricades on roads under construction, and destroying unfinished work.

14. That sidewalks be provided for the use of pedestrians along the highway adjacent to built up communities.

15. That pedestrians using the highways in the open country shall walk to the left, and that operators of all vehicles drive to the right.

16. That when one piece shipments that exceed the maximum weight allowed by law are made, they shall be shipped on specially built vehicles so designed as to distribute the load in a manner consistent with legal requirements, and only after obtaining permission from an authorized source.

17. That a uniform distinction be made between maintenance, betterment and reconstruction in order that comparisons may be made.

18. That motor vehicle taxation or license fees should not be any greater than that required to provide the sum necessary for maintenance of the highways.

19. That overloaded trucks being operated on the highways, when apprehended, be seized and held for a period of not less than five days, stored at the owner's risk and expense, and in addition the owner fined, in accordance with a penalty fixed for that offense.

20. That hauling companies, who contract for shipments by the ton, when caught overloading their vehicles, should have their license revoked, in addition to any other penalty.

21. That all operators of motor vehicles should be licensed, and that they be prohibited from operating a vehicle for more than twelve consecutive hours followed by eight hours rest.

22. That, in addition to any uniform motor vehicle law previously recommended, all applicants for drivers' license or renewal of same be required to submit a physician's certificate bearing date not more than one month back of the date of application. Certificate should be accepted only from designated physicians, and should certify that the applicant is in fit mental and physical condition to operate a motor vehicle.

23. That the examination for drivers' license require the applicant to be able to read and write English, and that license be granted only to citizens of the United States with provisions for tourists from other countries.

24. That the owners of all motor vehicles must carry liability insurance for each vehicle operated.

25. That all vehicles both motor and horse drawn be equipped with a clearance light visible from front and rear. This light should be of a shape other than round located on the extreme left side of the vehicle or load if over width, and showing green in front and red in rear.

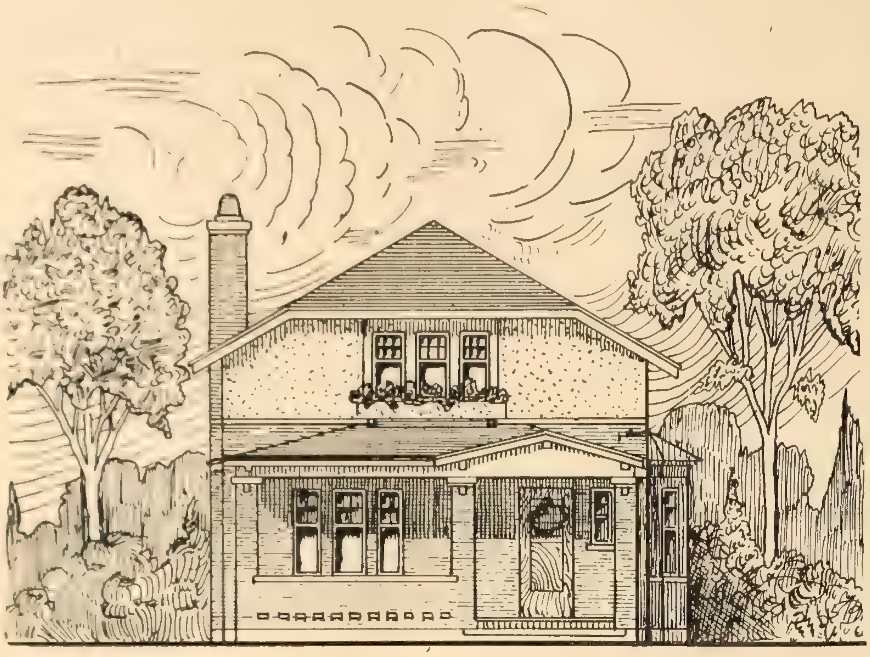
Correct Sub-grade Design

(Continued from page 749)

the next higher type. These selected soil roads may be called subgrade highways, and many times are the economic solution for road construction for a large portion of a State system. The selected material on these subgrade highways may be natural or artificial sand clay, topsoil, gravel or a selected earth.

In establising the grade of a road it is necessary to know the character of the various materials in order that the most suitable material may be selected for the subgrade. Many times it is more economical to raise the grade in the cuts and take advantage of the better material near the surface, and borrow material of high bearing value for the remainder of the embankment, than to balance the quantities by using the material from the cuts if it be of low bearing power. The engineer who attempts to balance quantities, disregarding the quality of the material entering the subgrade, will greatly reduce the strength and life of the road surface and its value to the public.

It cannot be said that the details of ideal design of subgrades up to this time have entered into the details of road construction, with the possible exception of drains, or where by chance the grading of the road supplied the better material. There are many elementary principles that have been established which are not being generally followed



The Contract Record's

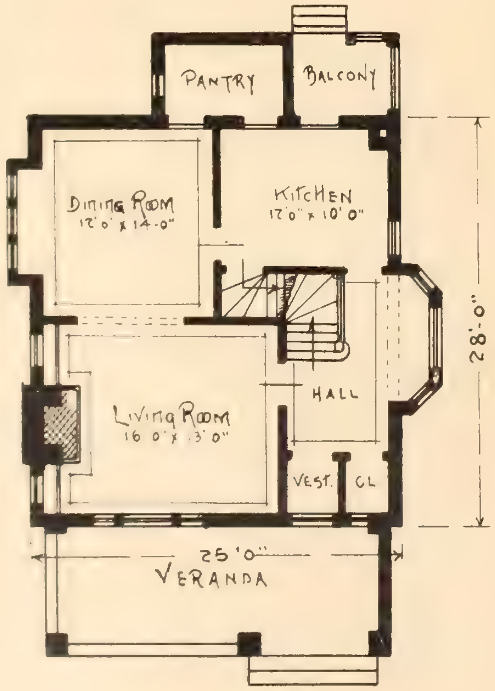
Weekly House Suggestion No. 77

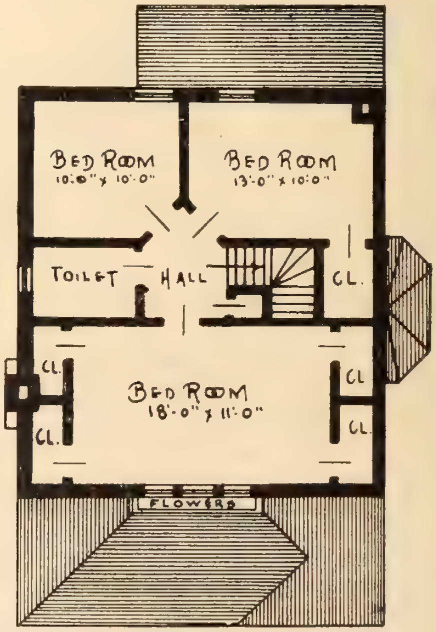
We are reproducing herewith illustration of a well laid out, reasonably priced home, erected recently in one of the residental districts of Montreal. The house measures 28 x 25 ft. The foundations are of concrete and the general construction is finished with a brick veneer to the second storey, the balance having a stucco surface. The roof is covered with asbestos shingles and the wide verandah at the front is of brick construction.

This is a widely popular type of home and was erected at the very moderate cost of $4,800 The rooms are all of a good size, hall space being kept down to the minimum, and the plan includes a roomy and well-placed pantry, which has separate entrances from the kitchen and dining room. The living room is a fine large room and is equipped with fireplace, as seen on plan. The wide bay window in the hall which is finished with window seat, is a very pleasing feature, especially where the house is located on a corner lot. The flooring throughout is of hardwood. The upstairs arrangement is very convenient and provides ample closet space in the various rooms.

The heating system is of hot air type.

Mr. J. A. S. Houle, architect, of Montreal, is the designer of this home.





Unsafe Practices in Building Construction are Cause of Many Accidents

Problem of Assuring Safe Building is Organizational—Shop Practice a Factor in Unsound Building—Recommended System of Control*

Many practices in the conduct of building are unsound and unsafe. This condition affects seriously the professional work of engineers as well as the security of the public. Its fundamental cause lies in the fact that incompetent persons are allowed to build, and do build. While this evil is deeply rooted in existing customs, its complete elimination is necessary to place building on a sound basis.

Effective reform rests on practical application of the view that building is a specialized technical activity involving a distinct hazard. In accordance with this view, building should be restricted to persons possessing the knowledge and skill required for carrying it on properly, namely architects and structural engineers. Combining competence, responsibility and authority in one person will effectively guard safety. The proper operation of this system of procedure should, of course, be protected by administrative control of the public building authorities, as a means of enforcement and as a check on full discharge of responsibility. Further, in view of the special position of professional men under the system indicated, co-operation by professional organizations in supervision of its working will be of value.

The subject of safe building is peculiar to no one city but is of nationwide concern and constitutes a single problem. It involves the engineering and architectural professions, the contracting industry, and civic and property interests. If effective reform is to be attained, representatives of all these groups should work together in shaping it and bringing about its adoptoin. Such a co-operative body should be so constituted, moreover, as to have broad geographical scope and influence. The committee recommends:

I—That the Board of Direction of the New York Section develop a plan for assembling a broadly representative body to devise and promote the adoption of a plan for eliminating unfit persons from direction of building as proposed by restricting it to architects and structural engineers and the practical definition of competence by state licensing; and that the Board initiate the organization of such a body through the Society.

II—That in order to oppose the practise of designing by code and to emphasize the necessity of applying independent technical judgment in design, the Section be asked to express itself in favor of defining a building code as a minimum and to promote the adoption of such definition by statute.

III—That consideration be given to the possibility of establishing continuous professional action on structural engineering matters and on building accidents, with a view to assuring the maintenance of sound conditions within the profession in connection with building ,assisting public building administration, and providing for the prompt detection and correction of faults in established technical practices in building.

IV—That, since the architectural attitude toward the responsibilities involved in building affects the corresponding engineering attitude, the Board endeavor to bring about joint consideration of these responsibilities with representatives of the architectural profession.

V—That the special problem of assuring and maintaining the safety of existing buildings, which was not covered by the present committee's work but which appears important, be made the subject of a separate inquiry.

General Building Conditions

Building failures occur under quite varied circumstances. As all such circumstances bear on the value of reform measures or safeguards, the committee sought information on building conditions and examined some 40 failures covering a period of more than 20 years. Of these 40, only two or three can be classed as unpreventable.

In general, the facts establish that building failures are not chargeable to insufficiency of existing technical knowledge, and that the problem of assuring safe building is organized rather than technical. Safe design and construction methods are known to men skilled in the art, but the actual conduct of building does not always assure that such methods will be used or such men be in control of the work—even in apparently normal practice, as in the Knickerbocker Theater case and some others. Common faults in the direction of building work are: Ignorance of what good building requires, a belief that building codes guarantee safety with ample margin for neglect or variation, dependence on the city building department, neglect of duty, confusion as to where responsibility lies or even absence of responsibility for some part of the work, and often plain cupidity. Technical men are sometimes involved, through incompetence or neglect of duty. It is stated by building officials that sharp practice in taking advantage of inevitable shortcomings of the building law is a factor in unsound building, and that deliberate evasoin of the law and even substitution of fraudulent plans for approved plans are known.

Briefly characterizing present conditions of building control, it may be stated that it is possible for a man with no knowledge of building to present plans for a building, to obtain a permit for erecting it, to employ craftsmen, sub-contractors or a general contractor of any character, to create public dangers subject only to the objections of a building inspector should such a man chance to become aware of the condition, and finally to put the structure to public use. He may engage an architect or an engineer and may dismiss him at any time—even at a stage when competent supervision is vital—and may direct the work himself. Or, he may in good faith engage as architect or engineer a man who is incompetent, who sells material or who solicits employment on the claim that he can save a few tons of steel over another designer or have a thinner wall approved by the department, or who is satisfied to represent an important truss by a rough diagram, trusting that proper construction will somehow be obtained.

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*Report of a Committee on Structural Safety on Building, presented to New York Section of American Society of Civil Engineers

Remedial Proposals

Several building reform proposals were advanced at the Section meeting of Oct. 18, 1922. The three principal ones are: (a) that of J. B. French, requiring that a structural engineer certify to the safety of any building of public assembly before it is opened to use; (b) that of R. P. Miller, restricting building permits to responsible persons registered with the city building department; and (c) that of L. D. Rights, making the owner legally liable in case he fails to employ a competent architect, engineer and superintendent.

The Miller and French proposals if applied effectively would have been of value under the conditions of some of the recorded failures. In many other failures, however, they would not have made the work safe; additional changes in building methods and control would have been required. The Miller plan, a direct attempt to eliminate unfit persons from direction of building, approaches closely to effective cure of the existing evils but its weaknesses in failing to provide technically competent conduct of work is vital. Basing the grant of a permit on "responsibility" in place of competence is believed to be open to decisive objections. Yet the plan has the great merit of being the readiest and simplest of the remedies for building evils so far proposed. The committee believes that, however modified, it should include the French plan, which is a necessary element in building reform.

The third proposal, to hold the owner liable for employment of competent men to plan and erect this building, has a fundamentally important purpose. Its practical value depends on the means used to bring about the specified result. No such means have been suggested. The owner's financial liability for damages resulting from failure of his structure, which exists under the common law, is not a sufficiently powerful motive, as past failures demonstrate, and any attempt to attach criminal liability to the owner is believed to be questionable in both its legal and its practical aspects. The principle that safety requires that building work be planned and directed by competent men is not likely to be applied much more effectively than at present so long as the owner is left free to choose. If the principle is valid it is a proper subject for mandatory legislation. The owner's interest will in any event supplement the architect's or engineer's responsibility, since both parties would be subject to penalty. But the primary authority and responsibility for the work must be placed definitely in the hands of the technical man. Any uncertainty on this point will merely perpetuate the present causes of building failures.

Other proposals for guarding against unsafe building, advanced on earlier occasions by various investigating bodies, were also examined by the committee. It appeared that most of them were the response to one particular failure or one set of faulty conditions, and would fail under other conditions. A general proposal to bond every building operation, with evident expectation that the surety would guard the safety of the work, is not believed to be either effective or practically acceptable. Three important proposals are those contained in the report of the Brady-Eidlitz-Just board[1] in 1905, and those made in 1922 by expert committees of the Associated General Contractors and the Washington chapter of the American Association of Engineers[2] after investigating the Knickerbocker theater collapse. Most of their individual recommendations are necessary parts of an adequate system of building reform; the first-mentioned report is particularly noteworthy.

Technical Direction by Public Agency

All thoughtful discussion of building safety has recognized that competent technical direction is the necessary fundamental. Many believe however, that this can be obtained only by governmental agency; in other words, that there is no hope for better building except through more complete plan examination and field inspection by the public department. Even the likelihood that such development would reduce the engineer's and architect's functioning to minor rank does not appear to discourage these opinions. The committee is convinced that improvement does not lie in this direction, and that on the contrary the public supervisory functioning should be adjusted to the purpose of assuring efficient and dependable functioning of the private parties to a building operation. It may be remarked that if full technical guidance of building were to be supplied by the city building department, the cost of carrying it on would be multipled ten to thirty times, and a quite unmanageable administrative machine would be created.

Provisions for Effective Technical Control

Responsible technical direction of building work with full authority is provided at present in building operations of the higher grade on the initiative of the owner himself, who retains an architect or engineer and leaves this technical man free to work out the problem with full responsibility until ultimate completion and even beyond. Where the system is applied in full, it is entirely effective. The combination of technical competence with complete authority over the work and responsibility for the result represents the basic essential of sound and therefore safe building practice. In the lower class of building work, and especially in speculative building, this system is more or less completely disregarded. The elimination of unsafe building conditions may be brought about by compelling the application to this class of building of the same sound system of building direction that is adopted in high-class building work as a matter of course. While it is true that the owner's interest would even now be served by the adoption of the same system in his work, whatever the kind or grade of building to be constructed, this advantage is not powerful enough to overcome his willingness to gamble against the chance of mishap for the sake of a cheaper result. Legal institution of the system must therefore be resorted to. The method of doing this should, for practical reasons, take account of the weaknesses of present building control.

List of Weaknesses

A list of such weaknesses, compiled largely from the facts of actual failures, is given in the belief that it represents more or less completely the prevailing situation in most cities:

(a) Unauthorized building may go on.

(b) An incompetent or irresponsible person may apply for a permit to build.

(c) The applicant does not undertake to conduct the work and does not assume responsibility for the result.

(d) Plans may be drawn by an incompetent person, or by one not competent in some essential part of the work; plans drawn by a competent person may be changed by an incompetent one; neither designer nor user warrants the adequacy of the plans.

(e) Where structural engineering enters into the plans, this part of the design may be furnished by others than the designer, including material men, without assumption of responsibility and without proper check on its adequacy.

(f) A permit may be issued to any one, regardless of competence, and frequently any one may build under the permit.

(g) Permits are sometimes issued on incomplete plans, and even on unapproved plans.

(h) The permit usually imposes no obligation beyond following the building law, and fails to make safe building a condition of the permit.

(i) Competent technical direction of the work is not required.

(j) Difficult engineering operations may be undertaken without engineering direction.

(k) The technical authority is not final, and if the architect's or the engineer's authority on the work is overruled by less competent persons the building department is not concerned.

(l) Inspection by the building department, weak as it is, constitutes the main protection against violation of building law or safe practice.

(m) Control powers as represented by stop orders, suspension or revocation of permit, or special inspection charges, are not always provided or used.

(n) Competent certification of completion in accordance with the plans, the building law requirements and the demands of safe construction is not made a requirement.

Three of these defects in control, namely (a), (g), and (m), are mere administrative shortcomings, and require no essential change in building control; for example, both police co-operation and prominent placarding of building operations have been found effective in preventing unauthorized building. All the other defects, however, involve either a failure to demand that building be directed with competence, or failure to insist on proper discharge of the responsibility arising out of the work.

System of Control

A system of technical control devised to meet the conditions indicated by these defects requires the following main provisions:

(A) The conduct of building is to be limited to structural engineers and architects.

(a) Application for a permit must be made by an architect or a structural engineer. Permit is to be granted only to the applicant, is to be non-transferable, is to stipulate his continuous direction of the work, and to authorize building only by the permit holder himself or by a registered builder.

(B) Architect and engineer are to be held responsible in design, detailed supervision and inspection of execution for safe conduct and completion of the building operation, and are to be placed in full authority over the work.

(b) Plans for a building must be prepared by an architect or a structural engineer and must bear his personal certification that he prepared the plans, that they conform to the law and that they are adequate for safety. The applicant must certify that he has checked the plans and accepts them as his own. Preferably he should be required to submit proof of the adequacy of the design in its main features, and on demand of the department also of any details.

(c) Application for the permit must include a specific undertaking to conduct the work and assume responsibility for its adequacy until completion. The permit must embody this undertaking.

(d) In all dealings with the work under the permit the department must recognize the permit holder as in charge to make his authority over the work fully effective.

(e) A certificate of completion, adequacy and conformity to plans and law must be rendered by the permit holder, the certificate to be filed of record with the plans.

(C) Engineering competence is to be provided for the design and construction of buildings or parts of buildings involving engineering elements.

(f, g, h, i) Provisions identical with (b) to (e) apply to engineering work, but should be established separately because past failures have shown that there is special danger in indefinite merging or overlap of architectural and engineering responsibility. Personal certification of design is here also essential, regardless of whether the designer is in independent practice, is employed professionally, or is a material man or contractor. Supervision and certification of completion are to follow.

(j) Special engineering work, as difficult shoring or underpinning, requires special direction, and the department must have power to demand such direction at any time.

(D) Means are to be provided for enforcing these requirements through the administrative procedure of the building department, with revocation of permit and assessment of costs on the property as measures of control.

(k) The efficiency of the building department must be increased in order to administer these measures. Its inspection staff should be raised to the architectural and engineering grade.

(l) Control must be improved by requiring the approved plans to be kept on the work, by specific vesting of power in the department to require additional safety measures or special direction, by more careful safeguarding of changes of plan during construction, by use of stop orders, by provision for revocation of permit, and by provision for assessing the cost of all special control proceedings on the property as a lien.

(m) Power must be vested in the department to refuse plans or applications for permits from an architect or engineer who has made himself subject to revocation of a permit.

(n) Registration of builders with the department is desirable for more effective control.

(o) Registration of building supervisors for minor work is a desirable auxiliary.

(E) Competence of architects and structural engineers is to be established by a licensing system.

(F) Revocation of license for cause is to be provided for.

This outline is given not as presenting full working details but as indicating the essentials sufficiently for proper consideration of how building practice would function under mandatory technical control. The actual details should be framed by a body composed of representatives for the several parties con-

[illegible] after joint study of the subject. Such study could properly be extended to include a determination of the scope of building control, so as to decide what classes of structures not intended for occupancy affect public safety so directly as to require the same control as buildings.

Defining Competence

The necessary definition of what constitutes a structural engineer or an architect may be attained by state licensing. Licensing alone merely defines the technical man, and cannot materially improve building conditions unless provision is made for placing him in control of building work. The Illinois license and restriction laws for architects and structural engineers seem to be operating fairly well so far as they go; as they protect only design and fail to demand competence in direction of construction they can have only a limited effect.

Supervisors and Builders

Establishment of a separate grade of building supervisor is believed to be warranted only for the proper care of minor building work, and such operations as demolition. Work of definitely technical kind should be directed by the engineer or by a man of equal grade who will accept the design on his personal checking and assumption of responsibility. Local registration of building supervisors with the building department is preferable to state licensing, and will facilitate closer check on their functioning. Registration of builders, proposed some years ago by R. P. Miller and endorsed by the Building Officials' Conference, is also considered desirable, less for eliminating incompetence than for strengthening the department's control over building practice by enabling it to place a penalty on the builder who works unsafely or in violation of law.

Professional Co-operation

Certain professional questions are connected with safe building. Since good building depends ultimately on the skill and integrity of engineers and architects, the attitude of the professions will influence the results obtained. When these professions further are established as solely competent to carry on building, the professional status is an even more important subject of consideration. The committee believes that the questions concerned merit careful study. It recommends that professional co-operation in bringing about and maintaining safe building conditions be considered, and suggests three elements of such co-operation: (a) Definition of the professional obligation incurred in engagements connected with building, and provision of means for combating incompetence and malpractice; (b) Formation of local groups or committees to maintain contact with building administration and its problems in the interest of sound building; (c) Provision for current study of building failures with a view to improving technical practices.

Existing Buildings

Representations have been made to the committee that the public confidence in the safety of theaters and halls has been sufficiently disturbed to warrant a general inquiry into their condition. While no widespread doubt of this kind is apparent, this fact in itself does not dispel the uncertainties arising from the collapse of the Knickerbocker theater. A general structural survey of theaters and halls by expert committees of professional engineering bodies acting in a disinterested way would constitute an important public service. Because of the magnitude of the undertaking, however, the committee is not prepared to recommend present action.

Quite apart from theaters, supervision of the safety of existing buildings is a matter of growing concern, particularly in regard to buildings of some age, to changed occupancy and to reconstruction. The collapse of the Stratford apartment house two or three years ago carried a warning to the possible instability of old buildings. Public building control faces many difficulties in assuring public safety with regard to existing structures, which rarely are in competent care. The committee believes that the subject should have consideration in any revision of building department functions. It also believes that a separate inquiry into the relation of existing buildings to public safety is desirable.

Proposed Railway Through Sahara Desert

Lack of Water Greatest Hindrance—Changes of Temperature Hamper Operations

In its last sitting the French Superior Council of National Defence discussed the question of the possibility of constructing a trans-Sahara railway, and considered the various plans which have already been drawn up with regard to the route to be followed and the method of traction to be adopted. At the conclusion of the discussion, a resolution in favour of the carrying out of the scheme was adopted. This decision has given rise to a number of discussions and articles on the subject of the best manner in which the idea might be carried out.

Although the lack of water appears to be the gravest hindrance to the work of construction, it is a difficulty which it is thought in some quarters may prove less serious than it at first appears. Only about half the route would be waterless, and for the other half, it is considered that it would be possible to transport modern boring machines on caterpillar-wheeled cars to points where there is reason to believe scientific boring might be successful. In any case, as the line progressed, water could be transported by it, sufficient for the 1500 workers who would be engaged on its construction.

Sudden and considerable changes of temperature to which desert regions are subject are, however, considered likely to hamper operations, both by reason of the bad effect on the workers and also by bringing about excessive expansion and contraction of the metal used. Another problem calling for careful consideration is that of fuel. It is pointed out that steam engines could not be used unless a supply of water was available all along the line, and to provide it would be very costly. Moreover, it would, it is urged, be inadvisable to make the railway entirely dependent on imported coal or oil, sufficient quantities of which would have to be carried to last the entire journey, or else a part of the traffic of the railway would have to be devoted to the provisioning of depots at certain points. Electric traction has been considered by one group, which proposes to establish a number of power stations utilizing the hydraulic power of certain regions of the Atlas and the Niger.

A suggestion which has received a certain amount of support is a proposal to use engines employing as fuel vegetable oils, which could be produced in close proximity to part of the route which would be covered by the railway. The advocates of this suggestion point out that the progress which is being made in the utilization of vegetable oils as fuel is such that by the time the line was laid there would doubtless be motors, driven by vegetable oil, powerful enough to ensure regular traffic on the line. Such a solution, it is urged, would give the railway much greater freedom of action than would the employment of any other means of traction.—The Engineer.

Letters to the Editor

R.R. No. 4, St. Thomas, July 20th, 1923

Editor, Contract Record:

Will you kindly allow me a small space for a few remarks in regard to road improvement on the London and Port Stanley Gravel Road between St. Thomas and the Port. The dust is getting to be a serious menace both to the people that live along the road as well as the travelling public. Last year the Suburban Commission was going to put a permanent road of some kind but failed to do so for some reason. This spring they made another attempt, but failed, owing, it was said, to the great expense of a cement roadway, the only type of road that would stand the travel. Bituminous macadam resurfacing was advocated but was rejected as not being serviceable. I have had some practical experience in building and resurfacing with bituminous macadam and I am of the opinion that it will stand the travel if properly constructed. To my way of thinking there are some things to be done if you are going to have a good roadway; the first is to have this roadway properly drained; get rid of the water; the next is, have your sub-grade rolled solid and firm as it can be done, so that you can have an even spread of stone all over your grade and not have to make up any low spots. The next is, you should have clean stone, and in order to get that the co-operation of the quarry men is needed. You cannot penetrate dust and where there is dust among the stone there is the weak spot in the road. There is a splendid foundation for resurfacing on the London and Port Stanley gravel road.

Thanking you for publishing these few remarks and trusting that we will get a permanent road of some kind and so get rid of the dust.

(Sgd.) William Irwin

The Hon. G. S. Henry, Minister of Public Works and Highways, under the new Conservative Government which has just been elected in the Province of Ontario, states that the widening of highways will be temporarily suspended until his Department has had an opportunity of studying the whole situation carefully. Work which is at present under construction will be carried forward without any delay.

An English Concrete Road

Highway Through Surrey County Carries All Kinds of Traffic Including Traction Engines

The road in construction by the Surrey County Council is the main road through Reigate to Buckland, and carries fast, heavy and light traffic including traction engines.

The width of carriageway is 30 ft., and the road has a width of 60 ft. between fences. The total thickness of concrete is 8 in., and is laid in alternate bays in two courses; the bottom course being 6 in. thick in proportion of 4:2:1, and the top course in proportions of 4:2:1½. The bottom course is well rammed with punners in and around the wire reinforcement, and when sufficiently advanced the top course is applied immediately so as to give the two layers a simultaneous setting.

The reinforcement used chiefly is Walker-Weston patent interlocked double-layer reinforcement, which is the most suitable for the work, especially having regard to the boggy ground, and where filling has been done with only a thin crust of 2 in. to 3 in. of ashes put on the soil across fields.

The filling varies in places from 3 in. to 7 ft., for a length of about 4,000 ft. lin. For a certain length of the road half-bays have been laid with the Walker-Weston interlocked double-layer, which is coupled up quite easily and at an angle of 60 deg. The depth of the steel framework is 5 in. between upper and lower layers, and the concrete at the bottom is about 1 in. under the reinforcing mats, and there is a surface cover of 1½ in.

The aggregate used and proportions are as follows:—

The bottom course (4:2:1) washed and graded gravel of coarse pit sand.

The top course of 2 in. (4:2:1½) same gravel used for portions of the road as the bottom course, only richer. Other portions of the road ⅜ in. clean granite chippings and sand as above.

The surface is finished to a camber of 1 in 50.

After completion, the surface is covered to a depth of 3 in. with soil and kept damp for twenty-eight days and is then uncovered and thrown open to traffic.

No sign of cracks has been observed anywhere.

It is interesting to observe that the materials required for the construction have been hauled over the finished sections of the road by a 16-ton traction engine with three trucks of an approximate weight of 45 to 50 tons over half-bays measuring 18 ft. by 15 ft. without the surface or the joints being affected. —the Surveyor.

Lockwood, Greene & Co. ,of Canada ,Limited announce the appointment of Mr. G. L. Mattice as manager of the Montreal Office following the resignation of Mr. Ewart G. Horne.

Harris & Norton, Architects, Halifax, are calling for tenders on addition to All Saints Cottage Hospital, Springhill, N. S.; estimated cost $12,000.00.

Mainly Constructional

East and West—From Coast to Coast

The following gentlemen compose the newly appointed Harbor Commission at Three Rivers, P. Q.: Messrs. Robert F. Grant, President, Joseph L. Fortin and Norman Labelle.

Works Commissioner R. C. Harris, of Toronto, has been instructed to prepare detailed plans of the two proposed sewage disposal and drainage schemes for North Toronto and the council, on resumption of business in September, will make their choice between the two. One scheme involves the expenditure of $11,144,000 and the other $9,811,000. The eleven million dollar scheme was recommended by the commissioner but the controllers recommended the less expensive one. The former cost was based upon an entirely new system of sewers with a new sewage disposal plant. The cheaper one was to include the use of $300,000 worth of drains that were laid by the old town of North Toronto before annexation.

Plans are now well advanced for the construction of an addition to the plant of Brandram-Henderson, Limited, at Montreal. The new building will be devoted entirely to the production of varnishes and enamels. When completed, this additional plant will be one of the most modern and best equipped of its kind in Canada.

Preparations for the calling of tenders for the work on the Port Colborne section of the Welland ship canal are being made by the department of railways and canals.

The government of New Brunswick has been actively engaged in the repairing and reconstruction of the many miles of road damaged or completely destroyed in the spring floods. A recent announcement by Premier Veniot is to the effect that all these roads have now been put in a passable condition for travel.

W. M. Sutherland Company, Ltd., of Toronto, was recently awarded the general contract for the construction of the new St. Mary's Hospital at Kitchener, Ont. at $258,000. This contract included the excavating, carpentry, plastering, painting, glazing, and roofing. The new hospital will be built on Queen's Park Crescent and construction will commence at once.

The one storey brick building on Windermere Ave., Swansea, owned by the Toronto Brick Co., Sun Life Bldg., Toronto, was destroyed by fire recently. They will rebuild.

Building permits issued at Prince Albert, Sask., for the month of June this year represented a total value of $4,300, a considerable decrease from the total of $19,955 for the same month last year.

The T. Eaton Company have taken possession of the Plant of the Hercules Rubber Co., Brampton, Ont., and will operate the factory in future under the name of the Brampton Tire & Rubber Co. Present plans are to increase the factory capacity to double the present amount, which will involve the erection of a large warehouse.

A new dormitory building is to be constructed at the Royal Military College, Kingston, Ont., as an extension to the present Fort Frederick dormitory, and the plans call for a new kitchen with mess room and a library. The sum of $76,000 was voted by the Government during the recent session of Parliament, and it is expected that the work will be started immediately. This new dormitory will provide accommodation for sixty-six additional cadets.

Many reports for public works improvements were approved at a recent meeting of the city council at Montreal, including the laying of the first section of the new 48-in. water main, from a point on Atwater Ave., North of Centre, by St. Patrick eastward to St. Patrick's park, south of the Lachine canal near Wellington St., This item will involve the expenditure of $157,725. A proposal to purchase ten motor trucks and eight street flushers, the whole costing $140,000, was also approved.

A report from British Columbia is to the effect that the Portland Cement company is negotiating with Dr. Hall, of New Westminster, for the latter's extensive cement-stone claims behind Popkum. Should this deal go through it is said that the Portland interests will start work early in the fall on an extensive program of development.

New dock at Pembroke, Ont., will go ahead according to the plans approved some months ago for a structure costing in the neighborhood of $125,000. Recently a grant of $50,000 was passed in Parliament for the institution of the work and tenders will be called for immediately.

Hollinger Consolidated Gold Mines has awarded contract for new dam and power house on Abitibi River to Sir Wm. Arrol, Limited, of St. Catharines, Ont., and London, England. Present plans call for the installation of equipment with a productive capacity of 25,000 h.p. Some 20,000 h.p. will be delivered at the mines for the use of the Hollinger company, and a further 2,000 h.p. will be at the disposal of the municipalities in the immediate neighborhood. It is anticipated that the development will be completed and power available for distribution in the fall of 1924. The engineers are Messrs. Kerry & Chace, of Toronto.

The contract for the turbines for the Hollinger Development at Portage Rapids, Abitibi River, has been awarded to the Dominion Engineering Company, Montreal. The general contract, as announced in our last issue, is in charge of Sir Wm. Arrol Ltd.

Mimico High School Board is negotiating for the purchase of property at a cost of $35,000 on which a high school will be built.

The London Board of Education have arranged for the purchase of a ten acre site in South London, which will be used for the extension of the Tecumseh School and for the erection of a new branch collegiate.

The Roman Catholic Church and Presbytery in Weedon, near Sherbrooke, was destroyed by fire. The building was valued at $75,000.

The local legislature has decided upon the immediate construction of a technical school in Sherbrooke.

Petrolia Board of Education are considering the erection of a new high school.

Fegles Construction Company have been awarded the contract for the construction of a two and a quarter million bushel storage addition to the Canadian National Railway Elevator at Midland.

A paving by-law for the expenditure of $300,000 was passed by the ratepayers of Sherbrooke.

The Canadian Pacific Ry. Co. has placed an order with the Algoma Steel Corporation for another 35,000 tons of rails.

The Durham County Roads Commission state that they have the assurance of the Deputy Minister of Public Highways that the Government will bear a percentage of the cost of the new Ontario Street Bridge in Port Hope.

A new concern in the Canadian West is the Herbert Paint & Varnish Co. which has recently been incorporated in Calgary with a capital of $100,000. They have purchased a large factory and will manufacture a full line of paints, stains, enamels, etc. W. R. Herbert is president and general manager.

It is stated that government work will begin in the near future on the proposed highway connection between North Bay and Cobalt.

The Department of Public Works, Ottawa, are preparing plans and specifications for the new Harbour in Oshawa.

CONSTRUCTIONAL ACTIVITY

Period of July 25 to July 31, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Bengough, Sask.
The Prov. Dept. of Highways, Regina, is receiving tenders till August 1 for the excavation of approximately 34,000 cu. yds. of earth and other work required in the construction of a provincial highway from Bengough south 8½ miles. Plans, specifications and profiles with the Dept. of Highways. Deputy Minister, H. S. Carpenter, Regina.

Belle River, P.E.I.
R. C. Desrochers, Secretary, Dept. of Public Works, Ottawa, will receive tenders till August 13 for breakwater extension. Plans and specifications at Dept. Offices of Dist. Engineers, Post Office building, Charlottetown and at Post Office, Belle Creek.

Burlington, Ont.
Tenders being received by Mr. Sykes, Clerk, till August 2 for reinforcing concrete retaining wall, west end Brant St.; plans and specifications with MacKay and MacKay, Engineers, Hamilton.

Chatham, Ont.
The Dominion Department of Public Works, Ottawa, is contemplating the dredging of the river at Chatham, Ont., to make it possible for larger boats to reach this port.

Collingwood, Ont.
Tenders being received by secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, till August 7 for dredging; plans and specifications at office of Dist. Engineer, Equity Bldg., Toronto, and with secretary.

Dunnville, Ont.
Public Utilities Commission is in the market for complete chlorinator equipment for chlorinating drinking water with powdered chlorine; minimum capacity 500,000 gals. per day; maximum capacity 1,000,000 gals. per day.

Fort Garry, Man.
The municipality of Fort Gary is receiving tenders till August 1 for the grading and ditching of McDonald Highway from the westerly boundary of the municipality to Waverly St. Plans and specifications with municipal engineer and the Highway Commissioner, Winnipeg, Man.

Grand Forks, B. C.
Work to commence soon on $20,000 irrigation dam; Christian Community of Universal Brotherhood, Ltd., Grand Forks, general contractor.

Hamilton, Ont.
Tenders being received till August 7 by secretary-treasurer R. C. Desrochers, Parliament Bldgs., Ottawa, for dredging, foot of Wellington St.; plans and specifications with secretary and at office of Dist. Engineer, Equity Bldg., Toronto.

Montreal, Que.
Plans have been drawn for a tunnel for 3 water mains under Lachine Canal, Atwater Ave.; tenders to be called shortly for tunnel under Lachine Canal to City for three water mains.

Tenders being received by Exec. Commission till August 6 for laying of sidewalks west side Benoni St. from Gonoud to Jarry; east side Benoni St. from Francoise to Jarry; both sides St. Gerard from Villery to Jarry; both sides Berri St. from Isabeau to Cremazie Blvd; plans and specifications with Road Dept.

Oshawa, Ont.
Surveys are now being made for harbor improvements.

Orillia, Ont.
Tenders were received by Town Council for 4,500 ft. of 10 in. tile for sanitary sewers, to cost $10,000.

Revelstoke, B. C.
Road repairs costing $10,000 are to be started at once on Revelstoke West Rd.

Sanford, Man.
Tenders will be received by the secretary-treasurer, H. Grills, until noon Wednesday August 1, 1923 for roadwork. Plans, profiles and specifications with Highway Commissioner, Parliament Buildings, Winnipeg, Man., and with secretary-treasurer.

St. John, N.B.
Repairs to sewers are contemplated; engineer G. G. Hare; portion of Charlotte St., 24 ft. terra cotta, $4,050. In market for pipe—city to lay pipe Forest St., 5 ft. wooden sewer $18,000; in market for pipe—city to lay pipe. Tenders to be called shortly for laying 420 ft. 9 in. terra cotta sewer; in market—city will lay 4751 wooden sewer pipe on King St.

South Westminster, B. C.
The South Westminster Dyking Commission called for tenders to reclaim 3,000 acres at a cost of $48,000.

Springside, Sask.
The Prov. Dept. of Highways, Regina, is receiving tenders till August 8, for the excavation of approximately 33,000 cu.-yds. of earth and other work required in the construction of a provincial highway from Springside 9 miles west. Plans and specifications with the Department of Highways, H. S. Carpenter, Deputy Minister, Regina.

Thessalon, Ont.
A $15,000 breakwater is contemplated by the Dept. of Pub. Works, Ottawa.

Toronto, Ont.
Tenders being received by C. A. Maguire, Chairman, Board of Control, till August 7, for concrete pavements on lane 1st west Bathurst St. (Olive Ave.); lane 2nd south College St., Markham St. to Palmerston Ave.; lane 1st east Close Ave. (Springhurst Ave.); lane 1st east Emerson Ave. (Armstrong Ave.); lane 1st north King St. (Wilson Ave.).

Tenders for concrete curbs on Atlantic Ave. and Brookside St., being received till August 7 by C. A. Maguire, Chairman Board of Control.

Tenders for asphalt and brick block pavements on Brookside Drive being received till August 7, by C. A. Maguire, Chairman Board of Control.

Tenders being received by C. A. Maguire, Chairman, Board of Control, till August 7, for asphalt pavement on Atlantic & Kimberley Avenues, Balmuto, Cottingham and John Streets, Grange and John Streets, Grange Rd., Midland Place and Milverton Blvd.

Tenders being received by C. A. Maguire, Chairman, Board of Control, till August 7, for bitulithic pavements on Milverton Blvd. & Stacey St.

Tenders being received by C. A. Maguire, chairman, Board of Education, till August 7, for laying and jointing 6 in. water pipes on Henning, Hilton, Rhyl and Weatherell Avenues; specifications at Dept. of Works, City Hall.

Thorold, Ont.
Tenders will be received by town council engineer, F. N. Rutherford, 24 Queen St. St. Catharines, till August 7, for laying of sidewalks (45,000 sq. ft.). Plans and specifications with engineer.

Twp. of Colchester North, Ont.
Tenders are wanted by the Township Council, Gesto, Ont., for Drain "Gignac"; engineers, Laird & Laird, Essex; clerk, A. C. Atkinson, R. R. No. 2, Essex, Ont.

Twp. of S. E. Hope, Ont.
Plans are being prepared by the Township Council for the laying of about two miles of drain.

Timmins, Ont.
Tenders will be received by town clerk, H. E. Montgomery, till August 1, for the following watermains and sanitary sewers: 10,000 lin. ft. 6 in. watermain; 8000 lin. ft. 8 in. and 10 in. sanitary sewers. plans and specifications with engineer, C. R. Murdock.

Yorkton, Sask.
The Prov. Dept. of Highways, Regina, is receiving tenders till August 8, for the excavation of approximately 47,250 cu.-yds. of earth and other work required in the construction of a provincial highway. Plans and specifications with the Dept. of Highways, Deputy Minister, H. S. Carpenter, Regina.

CONTRACTS AWARDED

Boucherville, Que.
Leger & Charlton Ltd., 400 St. Joseph St., Lachine, Que., are the general contractors for refection of road in Parish of Boucherville, Que.

Bowmanville, Ont.
Contract has been awarded to W. J. Culley, Bowmanville, for concrete walks

[illegible] approximately 1,000 sq yds.

Broadview, Sask.
Contract for improvement of road west from Broadview has been awarded to J. J. McFadyen of Wapella, Sask

Beauce Jct.—Sherbrooke Route, ue.
Contracts have been awarded by the Prov. Gov't. Dept. Roads, for refection of roads as follows: general contractor, Odilon Roberge, Ste. Marie, Co. Beauce, [illegible] Village, $7,361.06; St. Antoine de Pontbriand $14,350.52; Thetford Twp. $10,458.50, Robertsville Village $13,-221.76.

Duff, Sask.
Orr & Cuntz, Kamsack, Sask., are the general contractors for roadwork from Duff to Lorlie, Sask.; cost $10,500; work to start at once.

Edam, Sask.
H. S. Stewart, Battleford, Sask., is general contractor for roadwork from Edam to Mervin, Sask., 15 miles, to cost $17,600; work to commence at once.

Estevan, Sask.
Work is to start at once on roadwork from Estevan, west for 4 1/2 miles; cost $11,000, general contractor, Andrew Tottseleig, 1905 St. John St. Regina.

Islington, Ont.
Contracts have been awarded by Etobicoke Twp. council for laying watermain and steel water tower; engineer, R. O. Wynne, Roberts & Son, 88 Church St., Toronto; steel tower $21,800, Horton Steel Works Ltd., Bridgeburg, Ont.. casing water tower $5,389, Fred Barrett, Islington; watermains $2,300.50, Ruscica Bros., 256 Ontario St.

Leaside, Ont.
The Town Council has awarded the contract for sewers and watermains to F. F. Fry Ltd., 43 Scott St., Toronto.

Lunenburg, N. S.
Acadia Contractors, Ltd., Halifax, N.S., have been awarded the contract for dredging for the Provincial Dep't. of Public Works here, at $81,840.

Mimico, Ont.
The Town Council has awarded the contract for sidewalks to C. J. Mitchell, 98 Warden St., Mimico, at 19 1/2 cents per sq. ft.

Montreal, Que.
Contract for water mains from Atwater Pump Station to Lachine Canal has been awarded to Laurin Leach Engineering & Construction Co.

Nanaimo, B. C.
Cotton Company Ltd., is the general contractor for street paving, Fitzwilliam St., from Wallace St. to Railway Depot; cost $9,000

Oshawa, Ont.
Town council has awarded Tim Mothersill, Oshawa, the contract for laying of concrete sidewalks.

Port Dalhousie, Ont.
Somerville & Dilworth, 22 Cross St., Welland, have been awarded the contract for laying of concrete pavement to cost $42,572.

Rawdon—L'Assomption Highway, Que.
Contract has been awarded by Prov. Gov't. Dept. Roads, to Albert Brouillette, of St. Esprit, as follows: St. Esprit Parish $3,865.00, St. Jacques Parish $23,449,-08; St. Alexis Parish $2,312.23; road between St. Jacques J St. Alexis Parishes $936.85; road between St. Jacques and St. Alexis Parishes $8,120.01.

Revelstoke, B. C.
M. P. Cotton Co. Ltd., Vancouver, B. C., has been awarded contract for roadwork to cost $28,155.25.

St. Laurent, Que.
Work has started on sewers to cost $15,000; general contractor F. D. Beaulieu, 7 Cartier St., Ville St. Laurent.

Sandwich, Ont.
The town council has awarded contracts for sewers, and work is to commence at once as follows: Rosedale Ave. $640; Baby St. $63,350; Perry St. $7,377,-40; Alexander $2,196.06; S. P. West, Sandwich, Ont.

St. Pierre les Becquets, Que.
Laganiere, Houdie & Cie, Grondines Co., Portneuf, has been awarded the contract for water macadam pavement, Levis-St. Lambert route, to cost $141,-488.18; work to start at once.

Messrs. Dufresne & Marchildon, 10 Royale St., Three Rivers, have been awarded contract for dredging for the Dom. Dept. of Public Works, at $12,000. The contractors are in the market for a steam operated tug, with draught not over 5 ft., to haul their material scows.

Ste. Anne de Beaupre, Que.
Contract has been awarded to Nap. Trudel & Fils, St. Irenee, Co., Charlevoix, for refection of road, Quebec-St. Simeon Route.

Uxbridge, Ont.
J. W. Gould has been awarded the contract for laying a mile of granolythic sidewalk.

West Luther Twp., Ont.
Town council has awarded contract for municipal drain No. 19 to E. G. Boyd, Damascus, Ont., at 32 cents a cu. yd.

Wolfe, Sask.
Contract for improvement of road from Wolfe North has been awarded to Wm. Wells, of Wilkie, Sask.

Waterloo County, Ont.
The county council has awarded the following contracts for bridges, culverts and pavements; 2 reinforced concrete bridges, Alex. Fraser, New Hamburg $2,669 and $776.00 and 2 concrete culverts at $8.95 per cu. yd.; 2 culverts, Wm. Johnston, care of Clerk, at $10.68 per cu. yd.; 1 culvert Litchy Bros., Wellesley, Ont., at $11.00 per cu. yd.; pavement at Ayr, Ont., to Litchy Bros. at $2.70 per sq. yd.; pavement, curbs and gutters in Preston, Ont., to Stewart Construction Co. at $1.77 and $1.25 per sy. yd. respectively.

Railroads, Bridges and Wharves

Birtle, Man.
Tenders were received by the Municipality of Birtle, Man., for the construction of two bridges.

Brandon, Man.
Tenders being received by J. C. Murray, secretary-treasurer, till August 4, for the construction of concrete bridge north of section 36-10-18; plans and specifications and form of tender with Highway Commissioner, Winnipeg, or the office of the district engineer, Good Roads Board, 33 Smith Block, Brandon, Man.

Gladstone, Man.
The secretary-treasurer of the municipality, W. J. McGregor, will receive tenders till August 1st, for the construction of 7 timber bridges and 1 concrete bridge. Plans and specifications with Good Roads Board, Winnipeg, or Portage La Prairie, Man., or the Municipal Offices at Gladstone.

Glenelg Twp., Ont.
Tenders were received by Township council for reinforcing concrete bridge over Saugeen River on sideroad 15, concession 5, N. D. R.

Preston, Ont.
Tenders are being received till August 4 by town clerk George Wurster, for reinforced concrete bridge, length 200 ft.; 7 heavy pillars and 8 spans, width 54 ft., 6 ft. walk; 42 ft. space between curbs.

Prairie Siding, Ont.
Tenders will be received by Engineer W. G. McGeorge, C. E., 153 Queen St., Chatham, till August 10th for the construction of 2 concrete abutments and 2 concrete piers, 1150 cu. yds. concrete, 250 piles, and sheet piling.

Point Grey, B. C.
The B. C. E. R. Co. Ltd., Vancouver, B. C., are preparing plans for street car double track to cost $25,000.

Ste. Adele, Que.
Tenders being received by Deputy Minister J. L. Boulanger, Quebec, till August 11 for the steel construction of Dumouchel bridge on Aux Mulets River. Plans and specifications with Deputy Minister.

Stamford Twp., Ont.
Tenders will be received till August 3rd by the secretary W. W. Pope, Hydro Elec. Commission, Toronto, for the construction of the concrete substructure and reinforced concrete deck of a bridge across commission's power canal at Victoria street. Plans and specifications with engineer, T. U. Fairlie, Rly. engineer, cor. Centre Ave. & Elm St., Toronto.

Waterloo, Ont.
The Kitchener Light Commission are double tracking the street railway line on King St., from Union St. to William St., at a cost of $20,000, by day labor. Engineer, August R. Lang, c/o the commission.

CONTRACTS AWARDED

Carman, Man.
Municipality of Dufferin, Carman, Man., has awarded J. C. Badger and Sons, Morris, Man., for the contract for bridges to cost $15,419.87.

Montreal, Que.
Atlas Construction Co. are the general contractors for wharf construction, Sec 31, who will do all work and buy material.

South Hazeton, B. C.
Work is to start at once on reinforced concrete culvert and bridge fill to cost $30,000 for C. N. Rly. S. S. Magoffin &

Co., Prince Rupert, B. C., are the general contractors.

Public Buildings, Churches and Schools

Artland, Sask.
Tenders are being called by R. Surndell, Artland, Sask., for erection of school building. Architects are Waterman, Waterbury Mfg. Co., McCallum Hill Bldg., Regina, Sask.

Aylmer, Ont.
The Methodist congregation are planning the following alterations to the Methodist church here, at an estimated expenditure of $8,000: steam heating, memorial windows, electric organ pump, cork floor covering, electric water tank heater, toilets.

Briliant, B. C.
Work is to start at once on a fruit cannery to cost $60,000, for the Kootenay-Columbia Preserving Works.

Brampton, Ont.
Tenders have been received for the erection of a $40,000 sunday school for Grace Methodist Church.

Brandon, Man.
Tenders being received by Minister of Public Works till August 1 for plumbing, heating, ventilation, temperature control and radiation, (separately) for Hospital for Mental Diseases; plans and specifications at room 305 Parliament Bldgs., Winnipeg.

Brantford, Ont.
Plans are being prepared and tenders will shortly be called for the erection of a $75,000 school. Architect, F. W. Nicolls, 13 Temple Building.

Brockville, Ont.
Tenders are wanted by the local school board for a steel fire escape for 3 storey building. Secretary, B. F. Leeder, 76 Church St.

Burnaby, B. C.
Plans are being revised, and tenders called later, for a $19,000 school to be erected n. e. cor. Hastings St. & Holden Ave.

Kamloops, B. C.
Tenders for the erection of an Indian boarding school on Indian Reserve near Kamloops, to cost $175,000 will be received by the deputy superintendent of Indian Affairs till noon August 4. Plans and specifications with Department of Indian Affairs, Ottawa, Ont.

La Providence, Que.
Tenders are wanted by the school commission, county of St. Hyacinthe, for the erection of a $12,000 school. S. Rene Richer, 240 Girouard St., St. Hyacinthe, architect. No closing date has been set.

Mission, B. C.
Plans are being prepared for the 1st unit of Hospital to cost $15,000; architects, Benzie & Bow, 618 Standard Bank Bld., Vancouver; tenders will be called later.

Oliver, B. C.
Plans are being prepared for $10,000 government offices, Henry Whittaker, Parliament Bldgs., Victoria, architect.

Ottawa, Ont.
Tenders have been received by the city council for the erection of a fire station to cost $30,000.

Tenders have been received by the city council for a 100 h.p. boiler for Isolation hospital.

Plato, Sask.
Tenders will be received by the secretary treasurer of Bechtel School District, to August 3, for the erection of a school. Plans and specifications with secretary treasurer. Architect, M. W. Sharon, Parliament Building, Regina, Sask.

Raymore, Sask.
Plans for the erection of a $20,000 school are being prepared by the Raymore School Board.

Sarnia, Ont.
Tenders are being received by Robt. McKenzie, chairman Sarnia Curling Club, till August 1 for the erection of a curling rink.

Star City, Sask.
Tenders will be received by secretary C. B. Barkley to August 1, for erection of brick and tile school which will cost $30,000. Plans and specifications with Waterman, Waterbury Mfg. Co. Ltd., McCallum Hill Bldg., Regina, Sask., and with C. B. Barkley.

St. Jean Baptiste ,Man.
Tenders have been received by the St. Jean Baptiste Centre School District No. 941, for heating systems.

Sudbury, Ont.
Tenders for addition to Baptist church are being called; architect J. F. Francix Brown, 2 Bloor St. E., Toronto· no closing date. Plans and specifications with architect and Pastor, Rev. John Galt.

Springhill, N. S.
Tenders have been received by the Public School Board for the erection of a $30,000 school.

Thorold, Ont.
Tenders for school being received by Frank Pew, Secretary, 30 Chappel St., till August 1 for 250 ft. of 6 in. tile drain, 350 ft. of 4 in. tile drain, 2 concrete catch basins, 250 sq. ft. concrete walk; alsa separate tender on 2,000 yds. excavation and disposal to grade.

Toronto, Ont.
Tenders being received by W. W. Pearce, secretary, Board of Education, till August 2 for retubing boilers for sundry schools.

Tenders are being received by W. W. Pearse, secretary-treasurer, till August 2nd for electric fixtures, grading and field drain for Riverdale Technical School.

Tenders being received by W. W. Pearse, secretary, Board of Education, till August 2, for addition to Runnymede Schools, to cost $95,000.

Tenders were received by the Board of Education for an addition to Kew Beach School, value $26,000.

Tenders are wanted for the erection of a church on Crawford Street, between Harbord & Bloor; tenders being received by C. F. Taylor 83 Pendrith St. for plastering, plumbing, draining and concrete work, phone Hill. 3541J.

Vancouver, B. C.
Repairs costing $10,000 are contemplated to Orpheum Theatre, 765 Granville St.

Verdun, Que.
Tenders have been received for an addition to St. Clements Anglican Church, valued $50,000. Architects, Ross & McDonald, 1 Belmont St., Montreal.

Vineland, Ont.
Tenders are being received until August 4 by Fred Cook, secretary of Public School Board (S.S. No. 2 Clinton and No. 3, Louth), for the installation of direct steam heating system in Vineland public school.

Wadena, Sask.
Tenders will be called by Secretary Oscar Peterson, for the erection of a school and barn. Architects are Waterman, Waterbury Mfg. Co. Ltd., McCallum Hill Bldg., Regina, Sask.

Watson, Sask.
Tenders will be received by the Secretary Treasurer T. J. Gormican, for the erection of a brick and tile school building. Plans and specifications with secretary-treasurer.

Winnipeg, Man.
Plans of the proposed Memorial Hall were submitted bv J. N. Semmens, architect, at the last meeting of the Board. Estimated cost of hall complete is $800,000.

Repairs to foundation of Post Office, Portage Avenue, are being made.

Wolfville, N. S.
Plans are being prepared for a $250,000 auditorium and lecture rooms for the Acadia University. Architect L. R. Fairn, Aylesford, N. S.

Windsor, Ont.
Tenders are being received by the secretary, R. C. Desrochers, Parliament Bldgs., Ottawa, till August 9, for alterations to public building; plans and specifications are in the offices of Chief Architect, Dept. Pub. Works, Ottawa, res. archiect Dept. of Pub. Works, General Post office, Toronto, and the Caretaker of the Pub. Bldg., Windsor.

York Twp., Ont.
Tenders are being received by Jas. Knox, secretary, till August 1st for grading and concrete walks, etc., for school; plans and specifications with architect, D. R. Franklin, 578½ Yonge St., Toronto.

CONTRACTS AWARDED

Byron, Ont.
John Hayman & Sons, 432 Wellington St., London, have received the contract for Infirmary addition and Diet kitchen, also for stables, for sanitorium buildings to be erected at a cost of $35,000.

Bradford, Ont.
Contract has been awarded to Jas. Bogue, 220 Dublin Street, for the erection of high school to cost $60,000.

Charlton, Ont.
Thos. Brinnen is the general contractor for a church to be erected for St. Paul's Church, Haileybury; frame construction.

Carleton Place, Ont.
Norman Andison is the general contractor for the erection of a Parish hall, value $10,000, for St. James Church.

Campbellford, Ont.
The following have contracts on the $67,375 high school being built; structural steel, Hamilton Bridge Co. Ltd.; cut stone, Central Canada Stone Co., Tor-

onto; electric, R. H. Forsythe, Cambellford; plumbing and heating, Mason & Hawkins, Campellford; plastering, E. J. Curry, Toronto; painting and glazing, Fred G. Roberts & Co. Ltd., Toronto; steel sash, Architectural Bronze & Iron Works, Toronto.

Dartmouth, N. S.

A. M. Stuart, Halifax, N. S., is the general contractor for erection of $25,000 rink, R. A. Johnson, Halifax architect, Trussed Concrete Steel Co., Walkerville, Ont., supplying the steel.

Esondale, B. C.

Sub contracts have been awarded the following for addition to $600,000 Mental Hospital: excavation, A. B. Palmer Co. Ltd., Main St., Vancouver; millwork, J. M. Broks Woodworking Co. Ltd., New Westminster; mason and brickwork, J. B. Elligott, Vancouver; mastic insulate fillors, Henson & Co., Vancouver; brick supply, Evans, Coleman & Evans, Vancouver; slate roofing, Deegan & Sons, Vancouver, B. C.; sheet metal, Vancouver Sheet Metal Co. Vancouver; plumbing and ventilating, Murray Bros., 137 Powell St., Vancouver; elec. work, C. C. Carter, 739 Hastings St. W., Vancouver. Heating, Barr & Anderson, 1060 Homer St., Vancouver; Marble & Tile, Wm. N. O'Neil Co. Ltd., Vancouver; painting and glazing, Jas. Brooks Woodworking Co., New Westminster; steel sash, Gorman's Ltd., 1158 Homer St. Vancouver; ornamental iron, Westminster Iron Works Ltd., New Westminster.

Edmonton ,Alta.

Contract has been awarded for laundry equipment, Royal Alexandria Hospital, Canadian Laundry Machinery Co., Calgary, $15,158.37—washer, extractor, disinfector, flat ironer, eletrical panel control board; Beaver Laundry Machinery Co., Toronto, $3,250, sterilizing washer; O'Neill, Morfkin Machinery Co., $788.35, two L-38 Prosperity laundry presses in tandem.

Contract has been awarded to Pheasey & Batson Ltd., 203 Alexandria Blk., Edmonton, for the erection of a school to cost $132,787; plumbing and heating, H .Kelly & Co., 10350—97th St., Edmonton.

Fort William, Ont.

Work has commenced on $20,000 Mission Band building. Harry M. Scott, architect, H. Russell, general conrtactor; D. F. Anderson, plumbing and heating.

Hamilton, Ont.

R. Melick, 193 Ottawa St. N., is general contractor for alterations to St. James church. Architect W. E. Brown, 7 Hughson St. S.

Haileybury, Ont.

Hill, Clarke & Francois Co., New Liskeard, have been awarded the contract for new school, and work will commence at once.

Sherwood Constructing Co., Haileybury, is the general contractor for church and rectory being erected; and will let the following trades: roofing, sheet metal, electric, heating, plumbing, plastering, painting and glazing.

Jno. V. Gray Construction Co. Ltd., is the general contractor for the erection of $40,000 church and will let the following trades: roofing, sheet metal, electric, plumbing, heating, plastering, painting and glazing.

Dickie Construction Co. Ltd., Toronto, has ben awarded the contract for the new court house which will cost $150,000.

Hamilton, Ont.

Contracts have been awarded as follows, for the addition to the General Hospital: general contractor, W. H. Cooper, $95,702; marble and tile, Kent-Garvin & Co. Ltd., $24,731; plumbing, the Robert Fitzimons Co. Ltd., $22,553; electric, Culley & Breay, $6,781; dumb waiter, Otis Fensom Elevator Co. $185.00.

Hartland, N. B.

Smallie & Post have been awarded contract for building $50,000 school; architect W. D. McPherson; tenders being received by School Board for plumbing and heating.

Indian Head, Sask.

J. G. Trouth, 2105 Rae St., Regina, Sask., is the general contractor for a $12,873 orphanage to be erected; plumbing and heating, Potts & Miller, Regina.

Kinistino, Sask.

Work is to commence on $33,346 school; Waterman, Waterbury Mfg. Co. Ltd., Regina, general contractors.

La Riviere, Man.

Work has commenced on church annex and basement for Presbyterian Church Congregation. General contractor, J. H. Wilson.

Leaside, Ont.

Tenders were called by the Leaside School Board for the erection of a $65,000 school. J. Robert Page, 18 Toronto Street, wants prices on sub trades at once.

Montreal, Que.

Jas. Shearer & Co., 225 St. Patrick St., are the general contractors for the erection of a school, value $228,111 on Rielle St., Cote St. Paul, architect, J. S. Archibald, 314 Dorchester St. W.; electric, Vincent & Say Electric Co.; plumbing and heating, John Tweedle & Co.; roofing, plastering, marble and tile to be let.

Foundations for $1,250,000 office building, s. e. cor. MacKay & St. Catherine are going in; Thompson Starrett Co. Ltd., general contractors.

Moose Jaw, Sask.

Robinson Co. Ltd., 1841 Lorne St., Regina, Sask., are the general contractors for painting and decorating city hall and annex.

New Waterford, N. S.

A $70,000 hospital is being erected on Plummer Ave. Architect A. J. McCormack, Ross Block, Sydney, N. S., general contractor, W. A. Rudderham, St. Peters Road, Sydney, N. S., plastering, H. M. Israel, 120 Union St., New Waterford.

Nelson, B. C.

Waters & Co. Ltd., Nelson, B. C., have been awarded the contract for 2 school additions, to cost $50,000 each.

Point Grey, B. C.

C. A. Hichey is general contractor for the erection of $13,000 parish hall for St. Mary's Anglican Church. Architects, Sharp & Thompson, 708 London Bldg., Vancouver. Electric, plumbing and heating trades not let yet.

Regina, Sask.

Work is to commence at once on the erection of a $30,000 theatre for Famous Players Canadian Corporation. Storey & Van Edmond architects; More & McWilliams, general contractors.

South Vancouver, B. C.

Work is to start at once on addition to high school, cost $10,989. Architects, Twizell & Twizell, 719 Metropolitan Bldg., Vancouver; general contractor, F. C. Shantz, 403 Pender St. W., Vancouver; plumbing and heating Barr & Anderson, 1060 Homer St., Vancouver.

Ste. Rose du Lac, Man.

Work is to commence at once on $65,000 convent for Reverend Sisters of the Mission. Architect Chas. Bridgeman, C. P. R. Bldg., Winnipeg. M. P. Kelly, 83 Spence St., Winnipeg is general contractor and will sub-let trades.

Scarboro Twp., Ont.

Addition to $80,000 College for China Missions Corp., Scarboro Bluffs; architect, J. M. Cowan, 991 Bay St., Toronto; the following contractors want prices on sub trades; Witchall & Son, 156 St. Helens Ave., Toronto; Sullivan & Fried, 81 Victoria St., Toronto; R. Sheeby & Sons, 751 George St., Peterboro.

St. Hyacinthe, Que.

Ulric Boileau Ltd., 568 Garnier St., Montreal, are the general contractors for college now being erected; architects, Viau & Venne, Montreal; steel, Dominion Bridge Co. Ltd.; brickwork, Mr. D'Amour; plastering, G. Rochefort; painting, Napoleon Premont.

Sherbrooke, Que.

Foundations are going in for high school, value $90,000; general contractors, K. B. Jenckes, 25 Moore St., Sherbrooke; associate architects, Lawson & Little, Montreal; steel, McKinnon Steel Co. Ltd.; tenders are wanted for electric work.

Sydney Mines, N. S.

Work is now in progress on $80,000 school; E. D. Murphy, Sydney, is electrical contractor and Matheson & Gallop, North Sydney, plumbing and heating.

Sydney, N. S.

Chappels Ltd., 62-80 Brookland St., is the general contractor for addition to school on Park St., value $15,000.

Stratford, Ont.

Thos. Writt, Huron St., has received masonry and carpenter contract, $2,500, for addition to residence for Nuns Home; other contracts will be let shortly.

Toronto, Ont.

The following contracts have been awarded for school work: No. 3, $609 & No. 8, $735—W. A. Moffat Co.; No. 2, $650—Arthur Taylor; No. 4, $15,930. Architectural Bronze & Iron Works.

Thessalon, Ont.

Geo. P. Sandie, is general contractor for erection of school, value $32,000; architect, T. R. Wilks, 612 Queen St. E., Sault Ste. Marie.

Uxbridge, Ont.

Contract for all the concrete approaches and floors of the new high school has been awarded to J. W. Gould.

Vancouver, B. C.

Pacific Construction Co. Ltd., are the general contractors for erection of superstructure of $400,000 elevator. Mason, steel, elec. and plumbing trades not yet let.

Windsor, Ont.
Muxlow & Gale, 1342 Haward Ave, have received the contract for building separate school, at $134,000; plumbing, heating and electric to be let separately.

Wolfville, N. S.
Gates Contracting Co. Ltd., are general contractors for remodelling theatre with store front and office at cost of $15,000; J. C. Mitchell, electric, tiling, Maritime Tile Co., Halifax, N. S.

Business Buildings and Industrial Plants

Atli Inlet, B. C.
T. A. Kelly, 850 Hastings St. W., Vancouver, contemplates the erection of a $50,000 sawmill plant.

Cranbrook, B. C.
Tenders for the erection of $10,000 store and offices were received by architect, H. L. Swan, Penticton, B. C.

Corbyville, Ont.
Tenders will be received by the engineers, E. Pringle & Son Ltd., 20 St. Nicholas Street, Montreal, till August 2nd for the construction of 2 rack warehouses and 1 absolute alcohol building; mill and brick construction; the following general contractors are figuring: Patterson Construction Co., Belleville; R. P. White, Belleville; Carswell Construction Co. Ltd., Toronto; Norman McLeod Ltd., Toronto, Dickie Construction Co., Toronto.

Haileybury, Ont.
Tenders have been received for the erection of a $30,000 bank building by the Bank of Nova Scotia.

Hamilton, Ont.
W. J. Westaway Co. has considered proposals for erecting a new office building at MacNab and Main Streets.

Tenders have been called for the erection of a market, 8 stores, corner Ottawa and Barton Streets.

Kirkland Lake, Ont.
Work is in progress on the erection of a new mill for the Lake Shore Co.; mill capacity 300 tons per day.

Montreal, East, Que.
National Cement Co. are putting up a $4,000,000 cement plant; chief engineer, Louis Hurtubise, 90 St. James St.; roofing, electric, plumbing, silo, brick, crushers and machinery to be let.

Montreal, Que.
F. Dansereau, 216 Hampton Ave. is owner and builder of 16 garages being erected on Hampton Ave., between Sherbrooke and C.P.R.; roofing, electric, heating, plumbing and brickwork to be let.

Plans are being prepared for a $200,000 paint factory for Brandram-Henderson Ltd., Montreal. Perry & Webster, architects. Tenders will be called about August 15th.

Tenders for repairs costing $10,000 to Branch Bank of Royal Bank of Canada, 147 St. James St., are being called by the general contractors, Purdy & Henderson, 410 Mappin & Webb Bldg.

Mennon, Sask.
United Grain Growers Ltd., Winnipeg, Man., contemplate the erection of a $15,000 elevator. W. A. Bremner is superintendent of elevator.

North Vancouver, B. C.
Imperial Oil Co. Ltd., contemplate the erection of a $10,000 warehouse.

Oshawa, Ont.
Plans are being prepared for addition and alterations to Commercial hotel on King St. West

Tenders for the erection of a service building, have been received by General Motors of Canada, Ltd.

Ottawa, Ont.
Tenders for the erection of a $100,000 bank building are being called by John M. Lyle, 230 Bloor St. W., Toronto, architect. No closing date set. Plans and specifications with architect.

Smiths Falls, Ont.
Adam Foster is the owner of stores value $45,000 being erected on Russell St.; no materials purchased.

Toronto, Ont.
Plans are being drawn for the erection of a $275,000 office building at 92 College St., owned by Medical Arts Bldg. Syndicate; architect Hall & Duerr, Toronto.

Three Rivers, Que.
The Wabasso Cotton Mills Co. Ltd., contemplate the erection of three cotton mills, value $2,500,000; architects, pringle & Son, 20 St. Nicholas St. Montreal.

Victoria, B. C.
A $15,000 office building (Astrophysical Observatory) is contemplated by department of public works, Ottawa. Dr. J. S. Plaskett, Observatory, Victoria, is the architect.

Vancouver, B. C.
Board of Harbor Commissioners are erecting a grain elevator to cost $1,500,000. Northern Construction Co. Ltd., 736 Granville St. Vancouver, are the general contractors. The following trades not yet let:—mason, steel, roofing, electric and plumbing. Architect, A. D. Swan, 712 Pender Street W., Vancouver.

Work is to start at once on a store and warehouse, to cost $20,000, at 730-748 Richards St.; owners, B. C. Stevens Co. Ltd., Vancouver; architect, Franklin Cross, 448 Seymour St., Vancouver; plumbing, heating, electric, and plastering not yet let.

Winnipeg, Man.
A $20,000 building is being erected by A. P. Johannson, 796 Victor St., owner and builder. On completion of this building it will be used as a school for Icelandic children and then altered into an apartment building.

Windsor Mills, Que.
Tenders have been received by Kilgour Bros., Toronto, for the erection of a $100,000 factory; contract will be let to a Montreal firm.

White Rock, B. C.
Campbell River Lumber Co., contemplate the erection of offices and apartments to cost $9,500.

CONTRACTS AWARDED

Cornwall, Ont.
Canadian Kron Scale Co. are erecting a factory on Ninth St. East. John Eamer, general contractor.

The Walsh Plate & Structural Works will supply the structural steel for the extension to the Howard Smith Paper Mills. Through an error in a previous issue it was reported that the Phoenix Bridge & Iron Works had received this contract.

Lethbridge, Alta.
Work is to start at once on a $35,000 oil refinery for the Standard Refinery Co. Ltd. H. W. Whiddington, Sherlock Block, Lethbridge, is the architect; Jno. Odmark, 1806 Sixth Ave. S., Lethbridge, is general contractor.

Montreal, Que.
Traversey Ltd., 136 Papineau Ave., is the general contractor for repairs to Bank, 423 St. James St., to cost $30,000.

Fort William, Ont.
Work is to start at once on store and office building, Victoria Ave., Klomp & Hardy, 1021 Donald St., Fort William, general contractors.

Henry Morgan Co. Ltd., are the general contractors for addition to store and heating plant St. Catherine, between Union and Aylmer Streets, to cost $1,500,000. Glazing, Pilkington Bros.; tenders are being received by Frank C. Woodroffe, purchasing agent, on revolving and entrance doors, either in wood or bronze.

The following have received contracts on 17 flats being erected to cost $50,000, on Lafontaine between Sicard and Aird: roofing, P. Bedard, 632 Lagauchetiere E.; electrical, J. W. Tousignant, 637 Marine Anne E.; plastering, W. Deslongchamps, 219 Fifth Ave.; balance of work by day labor.

The following have received contracts on Knights of Columbus Council building, 255 Mountain St.; roofing, M. Chouinard; plumbing and heating, John Tweedle; plastering, R. D. Clark & Sons.

Brick and stone work has been started on repairs to store to cost $15,000, for City District Savings Bank, St. James St.; the following firms have contracts: roofing, plumbing and heating, Hicket & Aubert; plastering, Beaudoin & Fils; electric and painting to be let.

A $25,000 addition to plant of Benellac Lithographic Co., is to start soon; general contractor, J. Brazeau, 364 University St.; architect L. Lemieux, 364 University St.; steel, Dominion Bridge Co. Ltd.; brickwork, Chas. Lefrancois, 550 Ernscliff; plastering, F. Beaudoin & Fils; painting, Lavoie & Paquette; millwork, Benoit & Mathieu. Architect will call tenders shortly for balance of subtrades.

Moose Jaw, Sask.
Work has commenced on garage and stores costing $25,000 being erected for Moose Jaw Motors, Ltd., by C. Kjarsgaard, Redland Ave., general contractor.

Oshawa, Ont.
W. J. Trick & Co., 25 Albert St., Oshawa, have been awarded the contract

(Continued on page 56)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

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TOWN OF THOROLD

Tenders for Sidewalks

Sealed tenders marked, "Tender for Sidewalks", and addressed to D. J. C. Munro, Town Clerk, Thorold, Ontario, will be received until 5 o'clock p.m.

Tuesday, August 7, 1923,

for the construction of approximately 45000 sq. feet of sidewalks.

Plans and specifications may be seen and forms of tender obtained from the Engineer.

No tender necessarily accepted.

F. N. RUTHERFORD, Town Engineer,
24 Queen Street,
30-31 St. Catharines, Ont.

Notice to Contractors

Re Tenders for Court House, Port Arthur

Time for receiving tenders for the erection of the above building has been extended from Thursday August the 2nd to

Saturday, August 11th, 1923,

By order,
H. F. McNAUGHTON,
Secretary, Department of Public Works, Ontario.
Dated, Toronto, July 25th, 1923. 31

Tender for Concrete Piers and Abutments

County ol Kent

Sealed tenders will be received by the undersigned up till noon on

Friday, August 10th, 1923,

for the construction of Two Concrete Abutments and two concrete piers for the proposed bridge over the River Thames near Prairie Siding Station on the canadian National Railway.

The work involves the placing of about 1150 cubic yards of concrete and the driving of about 250 piles, in addition to sheet piling and other work.

Plans and specifications and forms of Tender and contract may be seen at the office of the undersigned, Chatham, Ontario.

Tenders must be accompanied by marked cheques for at least 5% of the amounts of the Tenders.

The lowest or any Tender not necessarily accepted.

W. G. McGEORGE, C.E.
30-31-32 Chatham, Ontario.

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

Queen Victoria Niagara Falls Park

TENDERS

Sealed tenders plainly marked as to contents will be received by the undersigned up to 12 o'clock noon, on

Thursday, August 9th, 1923,

for the excavation work, and laying of approximately 14,000 lineal feet of 6" and 4" cast iron water mains.

Plans and specifications may be seen, and forms of tenders obtained upon application.

A marked cheque for five per cent. of the contract price must accompany each tender.

The lowest or any tender not necessarily accepted.

JOHN H. JACKSON, Superintendent,
Queen Victoria Park,
31-32 Niagara Falls, Ont.

TO CONTRACTORS

Sealed tenders, marked "Tenders for Court House, Port Arthur," addressed to the undersigned, will be received at this Department until

Thursday, the 2nd day of August

for all works in connection with the erection of a Court House at Port Arthur, Ontario, with the exception of Heating, Plumbing and Electric Wiring. Plans and specifications may be seen at the office of Messrs. C. D. Howe and Co., Consulting Engineers, Port Arthur, and at this Department. Each tender must be accompanied by an accepted bank cheque payable to the Honorable George S. Henry, Minister of Public Works and Highways, Ontario, for five per cent. of the tender, and the bona fide signatures and addresses of two sureties, or the name of a Guarantee Company, approved by the Department, willing to provide a bond for the due fulfilment of the contract. The Department is not bound to accept the lowest or any tender.

By order.

H. F. McNAUGHTEN,
Secretary Public Works
Department, Ontario.
Toronto, July 17th, 1923.

Newspapers publishing this without authority will not be paid for it. 30-31

Tenders Wanted

For furnishing and installing a suitable Heating and Ventilating System for a six-roomed school. Tenders received up to **August 7, 1923.** Lowest or any tender not necessarily accepted.

F. E. SNIDER, Secy.,
Public School Board,
31 Bolton, Ont.

DEPARTMENT OF ROADS

Tender—Steel Bridge

Tenders made on forms supplied by the Public Works Department and placed under envelopes bearing the words: "Tender—Dumouchel Bridge," shall be received at the office of the Minister of Roads, in the city of Quebec, Government Building, until twelve o'clock of the afternoon (Eastern Standard time), on

Saturday the eleventh (11th) of August, 1923,

for the steel construction of Dumouchel Bridge on aux Mulets River in the municipality of the parish of Ste. Adele, in the county of Terrebonne, on the Montreal-Mont-Laurier Highway.

Each tender should be accompanied with an accepted cheque equal to ten per cent. (10%) of the total amount of the tender payable to the order of the Minister of Roads.

The Government of the Province of Quebec does not bind itself to accept any of the tenders.

J. L. BOULANGER,
Deputy Minister.
Quebec, July 26th, 1923. 31

Queen Victoria Niagara Falls Park

TENDERS

Sealed tenders plainly marked as to contents, will be received, by the undersigned, up to 12 o'clock noon, on

Thursday, August 9th, 1923,

for the supplying of the following materials:-

9,400—lineal feet of 6" cast iron pipe.
12—Hydrants.
12—T's.
8—6" Stop Valves.
8—Valve Boxes.

4,500—lineal feet of 4" cast iron pipe.
5—Hydrants.
6—T's.
4—4" Stop Valves.
4—Valve Boxes.

Information pertaining to materials and forms of tenders may be obtained on application.

A marked cheque for five per cent. of the contract price must accompany each tender.

The lowest or any tender not necessarily accepted.

JOHN H. JACKSON, Superintendent,
Queen Victoria Park,
31-32 Niagara Falls, Ontario

DEPARTMENT OF ROADS

TENDERS

Levis St. Lambert Highway

Tenders made on forms supplied by the Department of Roads and placed under envelopes bearing the words: "Tender—Levis-St-Lambert Highway, village of Leclercville," shall be received at the office of the Minister of Roads, in the city of Quebec, Government Building until twelve o'clock of the afternoon (Eastern Standard time), on

Tuesday the twenty first (21st) of August, 1923,

for the construction of an oiled waterbound macadam on Levis-St.-Lambert Highway in the municipality of the village of Leclercville, in the county of Lotbiniere, length 1.05 mile.

The Government of the Province of Quebec does not bind itself to accept any of the tenders.

J. L. BOULANGER,
Deputy Minister.

Quebec, July 28th, 1923.
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Town of Drumheller, Alberta

Tenders for
SEWERAGE WORKS

Sealed tenders will be received by the undersigned until 8 o'clock p.m. on

Wednesday, 15th, August, 1923

for the following:

Supply and delivery F.O.B. Drumheller of the following approximate quantities of material:

11,000 lineal feet of 4 inch to 18 inch vitrified tile sewer pipe and junctions.
18 tons of 12 inch cast iron pipe and special castings with flanged and lead joints.
500 lineal feet of 14 inch wire wound wood stave pipe.
40 cast iron sewer manhole covers.
2—300 I.G.M. Centrifugal sewage pumps with motors and automatic control equipment, and installation.
Automatic feed and discharge apparatus for Sewage Disposal Works. (Tenders for this apparatus only will be received until 30th August 1923).
Special manhole covers, manhole steps, flap valves, iron screens, ladders and miscellaneous equipment.
All labor and sundry materials for constructing sewers, manholes, pumping station and sewage disposal works.

Form of tender, specifications, contract and bond may be obtained, and plans may be seen, at the office of the undersigned at Drumheller, or at the office of Haddin & Miles, Ltd., Consulting Engineers, Calgary, Alberta.

Application for specifications must be accompanied by a cash deposit of ten dollars, which will be refunded upon receipt of a bona fide tender, or the return of the documents in good condition at the time of opening tenders.

Tenders must be submitted on the printed forms provided, and must be accompanied by deposit of an accepted cheque for at least five per cent (5%) of the amount of the tender.

The lowest or any tender will not necessarily be accepted.

H. A. BROWN,
Secretary-Treasurer.

Drumheller, Alberta,
July, 1923.
31

Tenders for Steel Bridge

Sealed tenders will be received by the undersigned up to and including

Friday, August 10th, 1923,

for supplying and erecting a steel bridge according to Plate 2, General Plans for Steel Highway Bridges, Ontario, 1917, 40 feet clear span—16 foot roadway—Class "A" loading; and for supplying the steel reinforcement for the floor of the above bridge.

Plans and Specifications may be seen at the office of the Engineer in Owen Sound.

Tenders must be accompanied by marked cheque for five per cent of amount of tender—cheques being made payable to the Treasurer of the County of Grey.

The lowest or any tender not necessarily accepted.

R. C. McKNIGHT,
County Engineer.
31-32

Tenders Wanted

Sealed tenders addressed to Leonard Sykes, Clerk of the Town of Burlington, will be received up to FOUR P.M. on

Thursday, August 2nd,

for the construction of a reinforced concrete retaining wall on BRANT STREET.

Plans and specifications can be seen and form of tender obtained from Messrs MacKay & MacKay, Town Engineers, Room 43, Home Bank Building, Hamilton, Ontario.

The lowest or any tender not necessarily accepted.

MacKAY & MacKAY,
Room 43, Home Bank Building,
Hamilton, Ontario.
LEONARD SYKES,
Clerk of Town of Burlington,
Burlington, Ontario.
31

COUNTY OF YORK

Breakwater

Sealed tenders, plainly marked as to contents, will be received by the undersigned up to 12 o'clock noon of

Thursday, August 9th, 1923,

for the construction of a concrete Breakwater on the South side of the Little Range River, near Reesor's Mill, on the town line between Scarboro and Markham Townships.

Plans and Specifications may be seen at the office of the Engineers.

The lowest or any tender will not necessarily be accepted.

FRANK BARBER AND
ASSOCIATES LIMITED,
Engineers, County of York,
45 Jarvis Street, Toronto.
Toronto, July 27th, 1923. 31

Wanted—Trenching Machine

in good condition for sale or rent. State size and price in first letter. Box 337, Contract Record, Toronto. 31

STEEL PILING

Bought and Sold

Universal Equipment Company
28-t.f. Niagara Falls

For Sale

Fireproof vault doors in good condition, apply Box 304, Contract Record, Toronto. 28-31

For Sale

Half million hard wire cut face or backing brick, for immediate delivery. Box 323, Contract Record, Toronto. 30-31-32

For Sale—Crane

Full Revolving, wide guage Travelling Crane, Full Revolving wide gauge Travelling Crane bucket. Box No. 344, Contract Record, Toronto. 31

For Sale—Cheap

1—6 ft. Wettlaufer Mixer on trucks with side loader and gasoline engine. Overhauled and painted and in good running condition. K. W. Lewis, 105 Front St. East, Toronto, Ont. 28 T.f.

Mixers for Sale

Two ¾ yard London Steam Mixers with all attachments, practically new, cheap for quick sale. The Wm. F. Sparling Co., 54 University Ave., Toronto. Telephone—Adel. 0177. 31

WANTED
Concrete Paving Mixer

State capacity, make and full particulars, also rental and purchase price. Box 343, Contract Record, Toronto. 31

For Sale

1 Sawyer Massey Road Grader.
1—50 ton bin and screen, with elevator and buckets.
1—London paver.

Box 291, Contract Record, Toronto. 30 t.f.

Cableway and Plant for Sale or Rent

One cable-way and plant, complete, consisting of:-
1—40 H.P. Locomotive Type Boiler.
1—Pair of cable-way engines, 9 x 12.
2—A Frames and 8 sheaves. Wire, Rope, carriage, etc.
We also have stiff-leg derricks.
1—36" Symonds Disc Crusher.
2—No. 4 Jenckes and 1 No. 3 McCully Gyratory Crushers.

And other miscellaneous equipment.

JAFFE MACHINERY EXCHANGE,
53 Montfort St., Montreal.
Main 8398. 30-31

SALES ENGINEER opening office in Montreal will represent responsible manufacturer on Commission basis. Box 341, Contract Record, Toronto. 31-32

Transmission line engineer wanted for location, design and construction high voltage steel tower lines. Apply Box 328, Contract Record, Toronto 30-31

Contractors' Equipment, consisting of Steel and Western Dump Cars, Small Locomotives, Steel Rails, etc., for sale. Apply Box 330, Contract Record, Toronto. 30-31

Niagara Falls Arena Limited

TENDERS

Sealed tenders plainly marked as to contents, will be received by the undersigned up to 12 o'clock noon of

Saturday, August 11th, 1923,

for

A Structural Steel

B. **Clearing site, grading, excavation, foundations and building Arena complete according to plans and specifications.**

Plans and specifications may be seen at the office of W. L. Wilkinson, Secretary, Niagara Falls Arena Co., Niagara Falls, Ontario, and at the office of the Engineers.

The lowest or any tender will not necessarily be accepted.

FRANK BARBER AND ASSOCIATES Limited,
Architects and Engineers,
45 Jarvis Street,
31 TORONTO.

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Business Buildings and Industrial Plants

(Continued from page 53)

for the erection of a service building for General Motors of Canada, Ltd.

Regina, Sask.

F. Bruce, 2317 Ottawa St., Regina, Sask., is general contractor for $20,000 stores being erected for Nay & James, owners.

Sussex, N. B.

W. A. Haley has been awarded the contract for the wiring on an $8,000 bowling alley; he also has the contract for installing the wiring requirements in the Dept. of Militia and Defence Drill grounds.

Toronto, Ont.

Work is now in progress on interior alterations to factory on Perth Ave., to cost $15,000; John V. Gray Construction Co. Ltd.,, 541 Queen E., general contractors; electric trade to be let.

Work is in progress for $30,000 machine shop, 773 King St. West, general contractor, L. E. Dowling; steel, McGregor & McIntyre, Ltd.

Sullivan & Fried, 81 Victoria St., are the general contractors for new car barns being erected on Roncesvalles Ave., to cost $250,000.

Tranquille, B. C.

Tenders will be received by P. Philip, chief engineer, Department of Public Works, Victoria, B. C., until August 1, for the erection of farm buildings. Plans and specifications with Department of Public Works, Vancouver and Kamloops. Architect, Henry Whittaker, Parliament Buildings, Victoria, B. C.

Vancouver, B. C.

Work is to commence at once on apartment to cost $60,000, corner 12th Avenue and Alder Street. Owners William Walker & Co., 1787—49th Ave. W., architects, McCarter & Nairne, 709 Northwest Bldg., general contractors John Galloway & Sons, 116—7th Ave. E.

Residences

Tenders are wanted at once on roofing, electric, plumbing, plastering, painting, millwork and brickwork trades, on 12 flats, $18,000, on Frontenac Street; owner and builder Jos. Malo, 159 Dufresne; architect, R. Charbonneau, 194 E. Cartier Square.

J. N. Gagne, 345 Girourard Ave., is owner and builder of 2 residences and stores, $25,000 on Sherbrooke near Prudhomme, and is now in market for paint and tiles.

J. H. Hand, 4857 Sherbrooke W., is owner and builder of 4 residences value $36,000, on Royal Ave. between Cote St. Antoine Rd. Roofing, electric, millwork and tiling trades to be let.

Fournier & Freres, 26 St. James St. are the general contractors for stores and residences, $30,000, to be erected on St. James St. near St. Ferdinand; roofing, electric ,plumbing, plastering, painting and millwork trades to be let.

Outremont, Que.

Collet & Freres are the general contractors for $27,000 cottage being erected on Maplewood, corner McCulloch; roofing, plastering and tiling to be let; balance of work day labor by general contractor.

J. Young, 572 Northmount, is general contractor for 4 residences, value $24,000, on Willowdale Ave.; architect, C. Cooke, 28 Dunlop; roofing, electric, plumbing, plastering, painting and tile to be let.

Port Colborne, Ont.

M. Zeleiskie is owner and general contractor for $12,000 boarding house being erected.

Toronto, Ont.

P. Cesterprovith, 98 Mulock Ave., is owner and builder of 1 pair stores and apartments east side Keele St., near Ewart Ave.; masonry, steel, roofing, electric, plumbing, heating, plastering and painting trades to be let.

Zaccaria Leone, 226 Chestnut St., is owner and builder of grocery store and apartment being built at 760 St. Clair Ave. W.; steel, roofing, electric, plumbing, heating, plastering and painting to be let by owner.

A. Clark & Son, 224 Augusta Ave., owner and builder of 5 residences and garages to cost from $12,000 to $15,000 each, is asking for tenders on plastering, electric, painting, heating and plumbing.

$15,000 residence is being erected on east side Robina Ave., near St. Clair Ave. Owner and builder W. Edmonds, 46 Glenholme Ave., architect, D. H. Burnham, 260 Lauder Ave.; electric, plumbing, plastering and heating trades to be let.

Tenders for plastering, painting, electric, plumbing and heating are being received by C. H. Grobb, 942 Shaw Street, owner and builder of $11,000 residence and garage, north side Winston St., near Roach Ave.

H. B. Taber, 215 Raglan Ave., is builder of $12,000 residence and garage on east side Raglan Ave., near Heathdale Rd.; electric, plumbing, heating, plastering and painting to be let.

Plans are being drawn for a $15,000 residence in Lawrence Park; owner and builder, Jno. E. Carlisle, 181 Dunvegan Rd. Work will start about August 30th.

J. Baxter, 336 Beech Ave., is owner and builder of pair residences value $11,000 being erected at 329-331 Waverly Rd. Electric, plumbing, heating, plastering and painting to be let.

Work is to start at once on a $10,000 residence, south side Baby Point Crescent, near Humbercrest Drive. Owner and builder, H. C. Roberts, 609 Federal Bldg.; electric, plumbing, plastering and painting trades to be let.

Winnipeg, Man.

A $10,000 house is being erected by Sparrow Bros., 144 Fort Street, Winnipeg, who are the owners and will sublet trades.

Sparrow Bros., 144 Fort St., Winnipeg, have commenced the erection of a $10,000 residence and will sub-let trades.

CONTRACTS AWARDED

Montreal, Que.

A Chenevert, 108 Delorimer Ave., is general contractor for 6 flats and garages, value $25,000 to be built on Papineau Ave. between Ontario and Sherbrooke; electric, J. Gascon, 145 Cartier St.; plumbing and heating J. Dalcourt, 232 Maisonneuve St.

The brickwork is up 1 storey on $20,000 residence on Pie IX Blvd., stone, Mr Desaulniers; steel beams, Phienix Bridge & Iron Works; brickwork, D. Savard; roofing, electric, plumbing, heating and plastering to be let; painting day labor.

Montreal, Que.

Foundations are going in for $60,000 apartment house, 169-179 Stanley St.; A. T. Dunnett, 918 Carrier Rd., general contractor; steel, roofing, electric, plumbing, plastering, heating, painting, tiling and millwork to be let.

Roofing, plumbing and heating for 3 residences and 3 garages on Madison, between Sherbrooke & C.P.R., to cost $32,000 is being done by E. Lapres, 322 Delinelle; balance of work by day labor; owner and builder, J. R. Lefebvre, 344 Addington Ave.

Work is to start shortly on 3 flats on Des Erables, near Sherbrooke; N. Levesque, 1924 Cartier St., is owner and builder of three flats on Des Erables, Near Sherbrooke, and work will commence shortly; roofing, electric, plumbing, plastering, painting, brickwark and millwork to be let.

Tenders are wanted on 12 residences to be erected on Beaconsfield Ave. 2 Storeys, 25 x 45; frame and brick construction; owner and general contractor, Lancashire Land & Construction Co.; prices wanted on all materials.

T. Lussier, 275 Wurtelle, is the owner and builder of a $15,000 residence and stable on Hochelaga near Bersy; plumb-

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Windsor, Ont.	- -	Thompson Auto 339 Pitt Street West

FEDERAL MOTOR TRUCK CO.
Detroit, Michigan

ing, E. Tremblay, 13 Perrault Lane; tenders wanted for painting; balance of work by day labor.

J. Gilletz & Co, 1188 City Hall Ave., is owner and builder of $15,000 residence being erected on Mance, bet. Bernard & St. Viteur, electrical, C. Elgan, 3326 Verville St.; plumbing and heating, J. Becker, 1431 St Dominique St.

L. Aubertin, 3157 Lafontaine St., is the general contractor for garage and alterations to residence to cost $10,000, at 156 Nicolet St., roofing, Canada Roofing Co.; electric, Mr. Duchesne, care of general contractor; plumbing, heating, plastering, painting and brickwork to be let

J. Seguin. 308 Gilford St., is the general contractor for 9 flats $30,000, to be erected on De Gaspe St., between 34th & 35th Aves., masonry, Frenette Theode, 615 Garnier; electric, J. Langement, care of owner, plastering, A Lacombe,, care of owner.

L. Lavigne, 1352 Wellington St., is the general contractor for a $10,000 house to be erected on Hibernia, between Ryde & Colleraine Sts.; brickwork, S. Marchessault, 134 Gordon, roofing, Jas Labelle, 449 Atwater.

Anglin-Norcross Ltd, are the general contractors for an apartment house being erected on Drummond Street. H. L. Fetherstonaugh, 85 Osborn Street, architect; millwork, W. M. Rutherford; refrigerator, Lind Canadian Refrigerator Co., boilers, Hall Engineering Co

Brickwork, stonework, excavation and foundations for $40,000 residence on Ontario Ave., is being done by Fussing & Jorgenson, 6 Dorchester St. W. Architect, J. Melville, 364 Dorchester St.

Foundations for $11,000 residence on Ballantyne Ave. are in; Thos Gray Construction Co, general contractors, and are in market for brick.

Outremont, Que.
Gilletz & Co., is the general contractor for $25,000 residence being erected on St. Joseph Blvd.; roofing, Douglas Bros.; electric, Chas Egan, plumbing and heating, J. Becker; painting, W. J. Large.

Ottawa, Ont.
Ed. Monette, 76 Fairmont Ave, is the general contractor for addition and alterations to residence, value $20,000, on Driveway, Ottawa, owned by Catholic Corporation of Ottawa.

Quebec, Que.
Abel Ratte, 492 St. Francois St., is the general contractor for a $25,000 residence being erected at corner St Louis & Murray Streets, Wm. H. Doyle, 34 St. Louis Rd., owner.

Toronto, Ont.
Mr Wm. H. Rutherford, 133 Ulster Ave., is building a $12,000 residence on Hillcrest Drive & Tyrell; architect, A. J. Stringer, 53 MacLean Ave.; plastering, Harry Hill, 16 Lawlor Ave.; decorating and painting, Thos. Lunn, 74 Sprucehill Ave

Winnipeg, Man.
C. V. Hastings, 55 Donald St., Winnipeg, is erecting a $13,000 residence. Fraser & McDonald are general contractors and will sub-let trades.

Westmont, Que
Fussing & Jorgenson, are the general contractors for $30,000 residence being erected in West Crescent Heights. Architects, Ross & MacDonald, 1 Belmont St., plumbing, B. Gregory, 55 Metcalf St.; furnace, Tess Oil Burner of Canada, 392 Dorchester W.

Reid Bros., are the general contractors for a $25,000 residence being erected on Clarke Ave; masonry, J. H. Hutchison, 64 St. Ambrose St.; tile, J. H. Dodgson, 745 St Catherine W.; plumbing and heating, W. G Bailey, 145 Bleury; ornamental iron, Faustin Ltd., 622 Beaudry St.

Nard Construction Co., is the owner and builder of apartment house of 48 suites, n.e. corner St Catherine & Melville; roofing, electric, plumbing, heating, plastering, painting, art stone, refrigerators, dumb waiters, telephone system, fire escapes, mail boxes, marble tile to bt let.

Power Plants Electricity and Telephones

Ainsworth(B. C.
Tenders are being called by the Florence Mining Co. Ltd, for erection of $175,000 electric power plant. No closing date. Plans and specifications with architect, who is the company's own engineer.

Buckingham, Que.
Doran Construction Co. Ltd, 104 Sparks St., Ottawa has received contract for $30,000 water power plant. Engineers Roy & Toupin, St. Catherines St E., Montreal. Work to start August 1st.

Burks Falls, Ont.
Knight Bros. Co. here are building new flume, 315 ft. long, 8 ft. diameter, and are preparing dam at a total cost of $20,000. Engineer, J. S. Parker.

Canada Hill, N. S.
Work has been started on dam and power development, for water power sufficient to light the town of Lockport

Campbellford, Ont.
R. S. & J. H. Henderson, 832 Weston Rd., Toronto, has been awarded the concrete work in connection with power development to cost $250,000 (dam No 8, Trent River).

Estevan, Sask.
Tenders will shortly be called by the Town Clerk A. B. Stewart, for a $22,000 electric lighting plant.

Esquimalt, B. C.
The Dom. Dept. of Pub. Works, through the secretary, R. C. Desrochers, Parliament Buildings, Ottawa, will call tenders for electrical equipment comprising a battery of three electrically driven pumps with a capacity of 180,000 gal. per minute, estimated to cost about $350,000, for installation at the Esquimalt dry dock.

Hamilton, Ont.
B. H. Prack, 1 Main St. E., is preparing plans for a $45,000 sub-station on Ottawa St. N., for the Hamilton Hydro-electric Commission.

Montreal, Qut.
Tenders are being received by Rene Bauset, City Clerk, till August 3 for the construction of underground conduits, manholes &c in that part of the city bounded by but excluding St. Lawrence Bldg. on the east, Craig St. on the south, Bluery St. on the west, bonded by but including Lagauchetiere St. on the north; plans and specifications at the office of the Electrical Commission, 83 Craig St., West, Montreal

New Sarum, Ont.
Work on hydro lighting and distribution system will start shortly, under the direction of Ontario Hydro Commission engineers.

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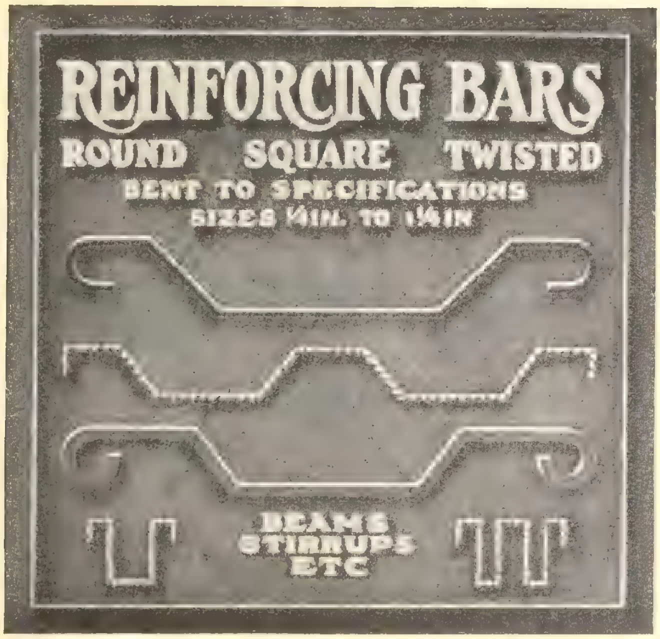
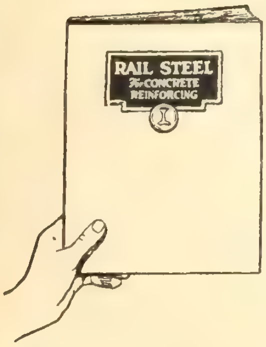


Bars are shipped bundled and tagged ready for placing.

Bending



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The first and only authoritative and comprehensive treatise on concrete Reinforcing Bars and containing most important information on the manufacture, qualities, and use of Rail Steel Bars.

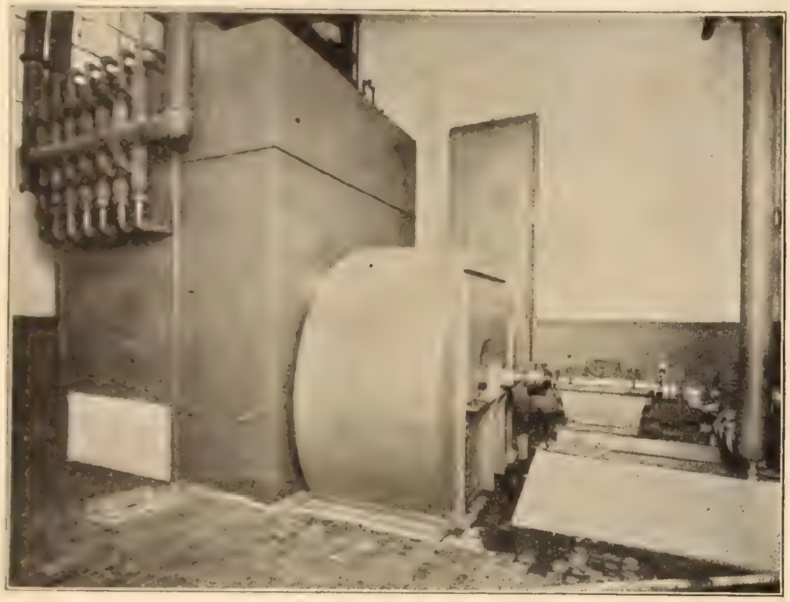
Specification A-16-14 requires that Rail Steel Bars be bent around a mandrel whose diameter is four times the diameter of the bar, and to the following angle:

Bars under ¾ in.—180°
Bars ¾ in. and over— 90°

Is it the fault of the steel, if a 1 in. bar inserted in a gas pipe refuses to stand a 135° bend? But you will say, "Contractors handle steel roughly on the job, and I propose to use structural grade steel that will stand rough treatment." Will you do that and sacrifice 25% in factor of safety, and at the same time use 20% more steel for which the owner pays?

"You don't design sharp bends in your reinforcing steel. If you'll insist that your contractor bends your steel as designed, Rail Steel Bars will easily stand every bend—saving you 20% in the cost of your steel, and at the same time increasing your factor of safety by 25%.

Specify your reinforcing to meet A.S.T.M. specifications A-16-14, or equal



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provide for an adequate and efficient Heating and Ventilating System. Sturtevant engineers, who specialize on such installations, are ready any day to co-operate with you.

Ask for folder 606, and complete information on the Sturtevant System, which provides a positive circulation of pure air (either warmed or cooled) in uniform quantities—efficiently—economically.

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PUTS AIR TO WORK

Completing Huge Filtration Plant

The largest water filtration plant in the world, with a capacity 60 per cent. greater than the largest now in existence, is nearing completion in Detroit, Mich., and will be ready for use this fall. It will cost $4,480,000.

The daily capacity of the new plant will be between 320,000,000 and 360,000 gallons of filtered water. In emergencies the reservoir may be drawn upon, increasing the output to 400,000,000 gallons. Theodore A. Leisen, engineer, said the largest filtration plant at present is the one at St. Louis, Mo., with a capacity of 200,000,000 gallons daily.

The new plant will give to Detroit pure, clear water, which it has not now. The water at present is purified by chlorine, but no provision is made for taking out sediment. Some experts, at a recent convention of 1,200 water-works engineers, said clearing Detroit's water supply would open the way for industries kept away by the muddy water. The dye industry was cited as one which could advantageously be established there if clear water were available.

Electrical Development in Italy

The American consul at Trieste, Italy, reports the approval on the part of the Royal Minister of Public Works of a project which involves the erection of two hydro-electric plants on the Upper Timavo and the Padoz (about 35 miles to the east of Trieste). The work of construction will shortly be initiated and it is calculated that electric energy of 35,000 horsepower will be developed.

Arrangements have also been made for the financing of projects which involve the construction of the first group of hydro-electric plants in the Sila Mountains in Calabria, with the necessary distributing lines, and for the completion of the program of hydro-electric development in southern Italy and Sicily.

Japanese Building Program

The American consul at Tokyo, Japan, reports the following hotels and buildings in course of erection: Sanyo Hotel (to be maintained by the Imperial Government Railway Department) at Shimonoseki; Denki Club at Tokyo (Marunouchi); and several municipal apartment houses at Tokyo planned by the mayor of Tokyo.

According to a press report the Japanese Government has decided to provide one of the large local electric-power companies with funds, at low interest, amounting to 10,000,000 yen (about $5,000,000) in two years, with which to continue the construction of a generating plant, which was temporarily suspended for lack of funds.

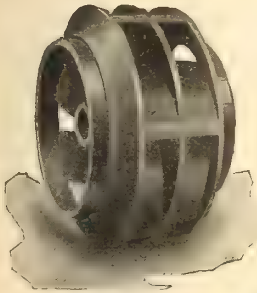
To Build a University in Korea

Plans to build a $5,000,000 university in Seoul, Korea, are being made by representatives of educational institutions in that country, according to word reaching Tokio.

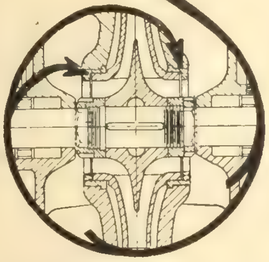
Law, economics, literature and science will be among the first courses offered, according to the present plans, and later courses in agriculture and medicine will be added. The library, athletic grounds improvement and other equipment is expected to cost $165,000.

Hydraulic balance, divided casings, renewable clearance rings and highest quality at reasonable cost characterize

"Canadian" Class "S" Pumps

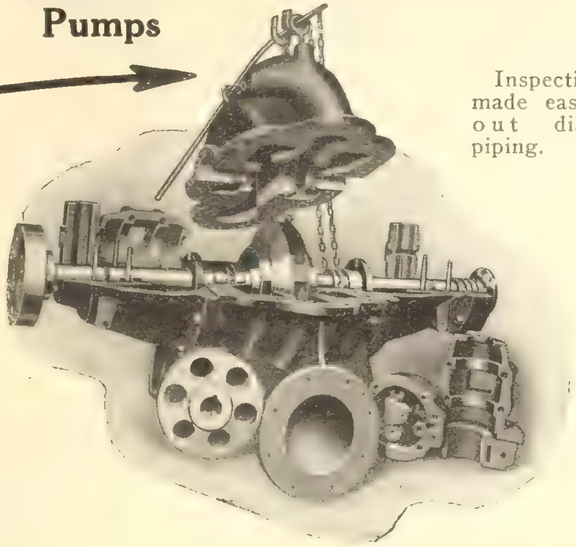


Double Suction impellers help assure hydraulic balance.



Easily renewable bronze clearance rings take any possible wear-saving casing.

Send for catalog No. 955-A-12 showing other designs and sizes.



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This SUBSCRIBERS' INFORMATION SERVICE is at your disposal free of charge. Should you wish a certain machine or certain engineering or contracting equipment, supplies, etc.—ask us.

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Address ....

Date............ Inquirer's Name ....

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BRICK COMPANIES
SAND AND GRAVEL COMPANIES
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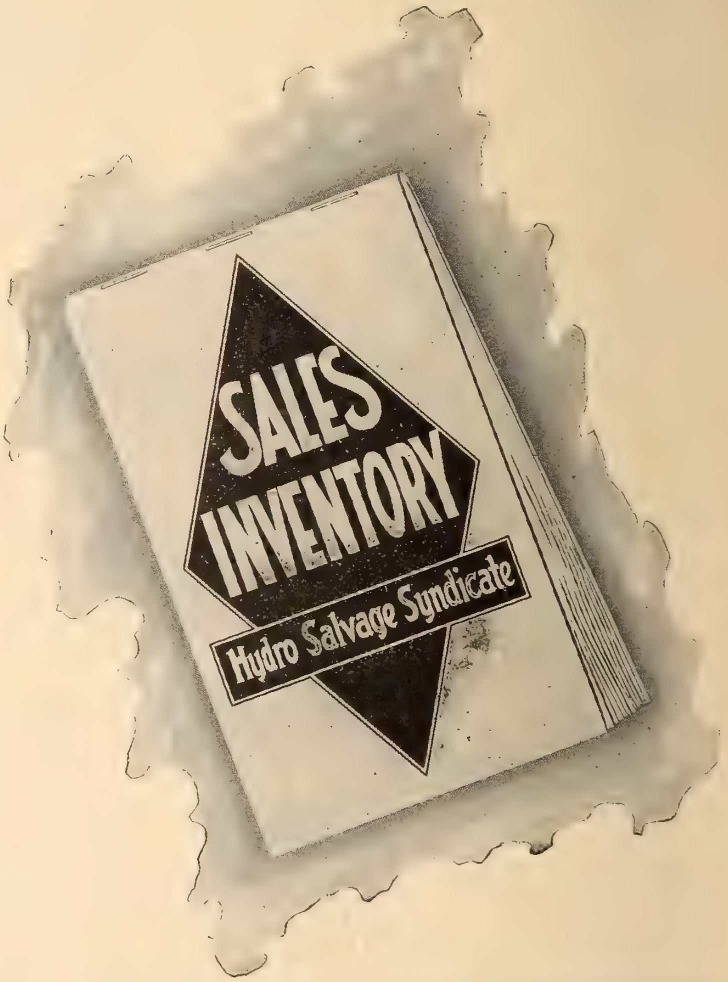

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Also, our experience is at your disposal, if you have problems to solve. We have about everything imaginable in Construction Equipment and Supplies at extremely reasonable prices consistent upon the excellent condition.

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and

F. H. Hopkins & Co., Limited
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Parliament Square, one of the many smooth, mudless, dustless Tarvia streets in Fredericton, N .B.

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"To construct moderate-cost modern roads that can be kept in good condition at little expense. In other words, to build the most miles of good roads possible, with the available road funds."

Fredericton found that Tarvia roads met these requirements. For it costs only a little more to build Tarvia Roads than plain water-bound macadam. And with inexpensive Tarvia maintenance there is no limit to the life of these smooth, dustless, mudless roads. Frost-proof and thaw-proof they stand up against the rigors of Canadian winters. Moreover the granular surface of a properly constructed and properly maintained Tarvia road prevents skidding.

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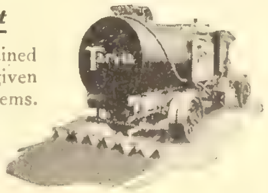

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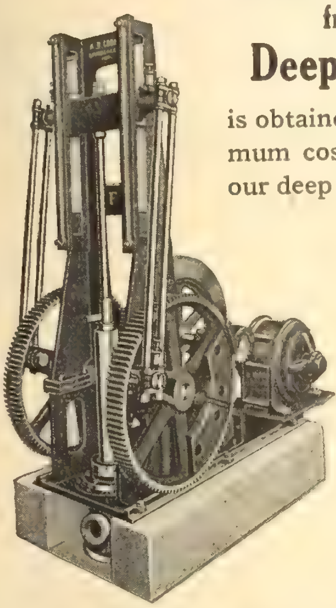

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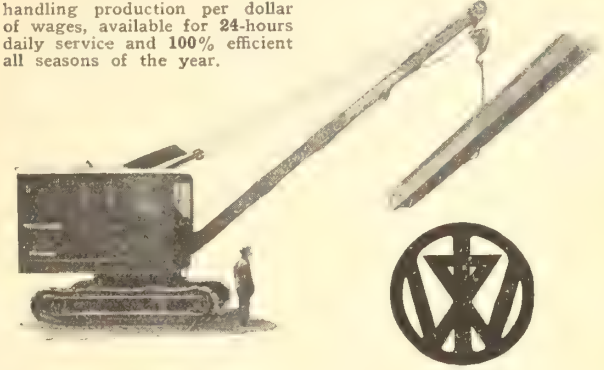

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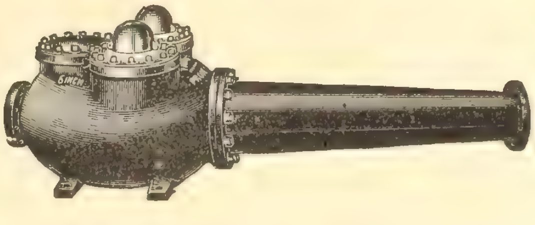

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Current Prices of Building and Engineering Materials

		Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.45
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	10.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	25.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*‡	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	25.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00**	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base	4.00 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.00 "	5.10 base	
Hoops	per 100 lbs.	5.00 "	3.75 "		
Twisted and deformed bars	per 100 lbs.	3.90 "	4.00 "	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	4.00 "	4.00 "	5.35	6.00
Structural shapes	per 100 lbs.	3.90 "	4.25 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.15	6.25
Plates—3/16 in.	per 100 lbs.	4.40 "	4.25 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.50 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.50 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
Cast iron pipe	per ton	65.00 "	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.45	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
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Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	94.50	65.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	45.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	135.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	145.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.25	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	70.00
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	15.00	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	14.50
Putty in bulk	per cwt.	5.95	4.25	5.50	6.50
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.38	1.40	1.26	1.56
Raw linseed oil, in bbls.	per gal.	1.35	1.38	1.23	1.53
Turpentine, in bbls.	per gal.	1.60	2.20	2.50	2.80
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	26.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.25	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers (Common)	per hr.	.40–.50	.30	47½–.55	.50–.56¼
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When you need it and as
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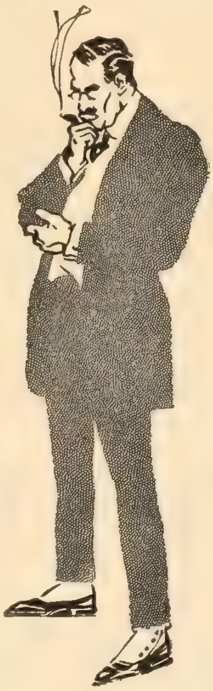

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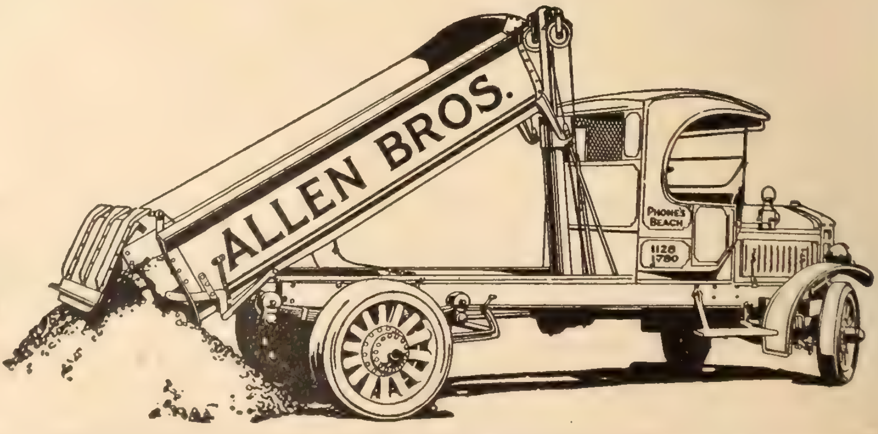

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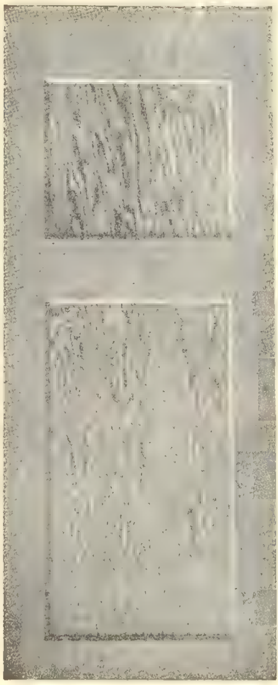

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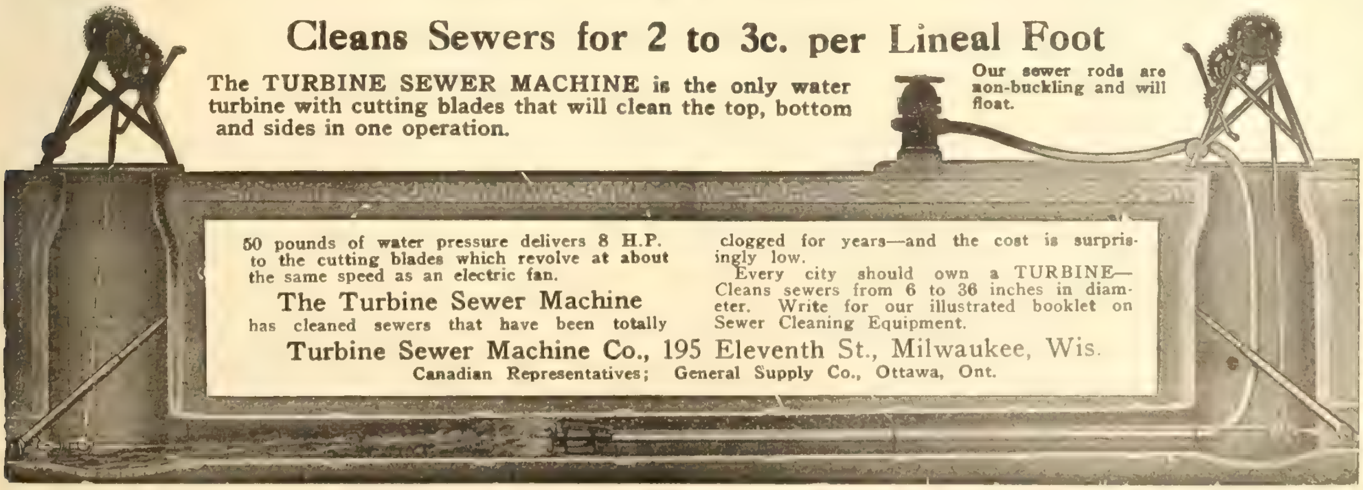
Our sewer rods are non-buckling and will float.



50 pounds of water pressure delivers 8 H.P. to the cutting blades which revolve at about the same speed as an electric fan.

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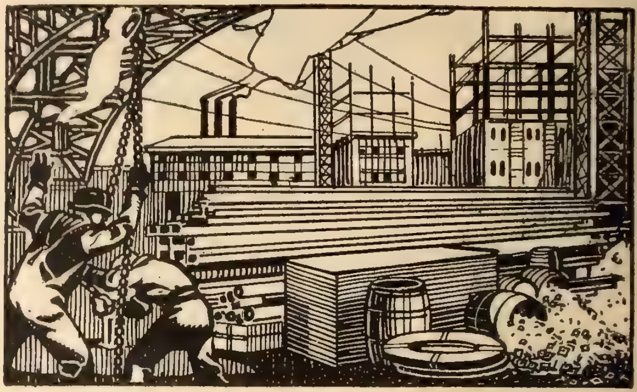

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Have the Lowest Upkeep and the Lowest Depreciation of any Mixer In the World

The Proof Twelve years of usage in the hands of thousands of contractors.

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And Now We add the most dependable power plant available—a Fuller & Johnson engine, with built-in rotary magneto, all sizes and models.

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RENFREW LIME

Because the mortar requires less tempering on the board. It will not set too quickly, and allows bricklayer to bed more bricks at a time. Bricks are easier bedded down. All these advantages helps the bricklayer to lay many more bricks each day. The mortar sets very hard. The lime will take more sand, and costs no more than other limes.

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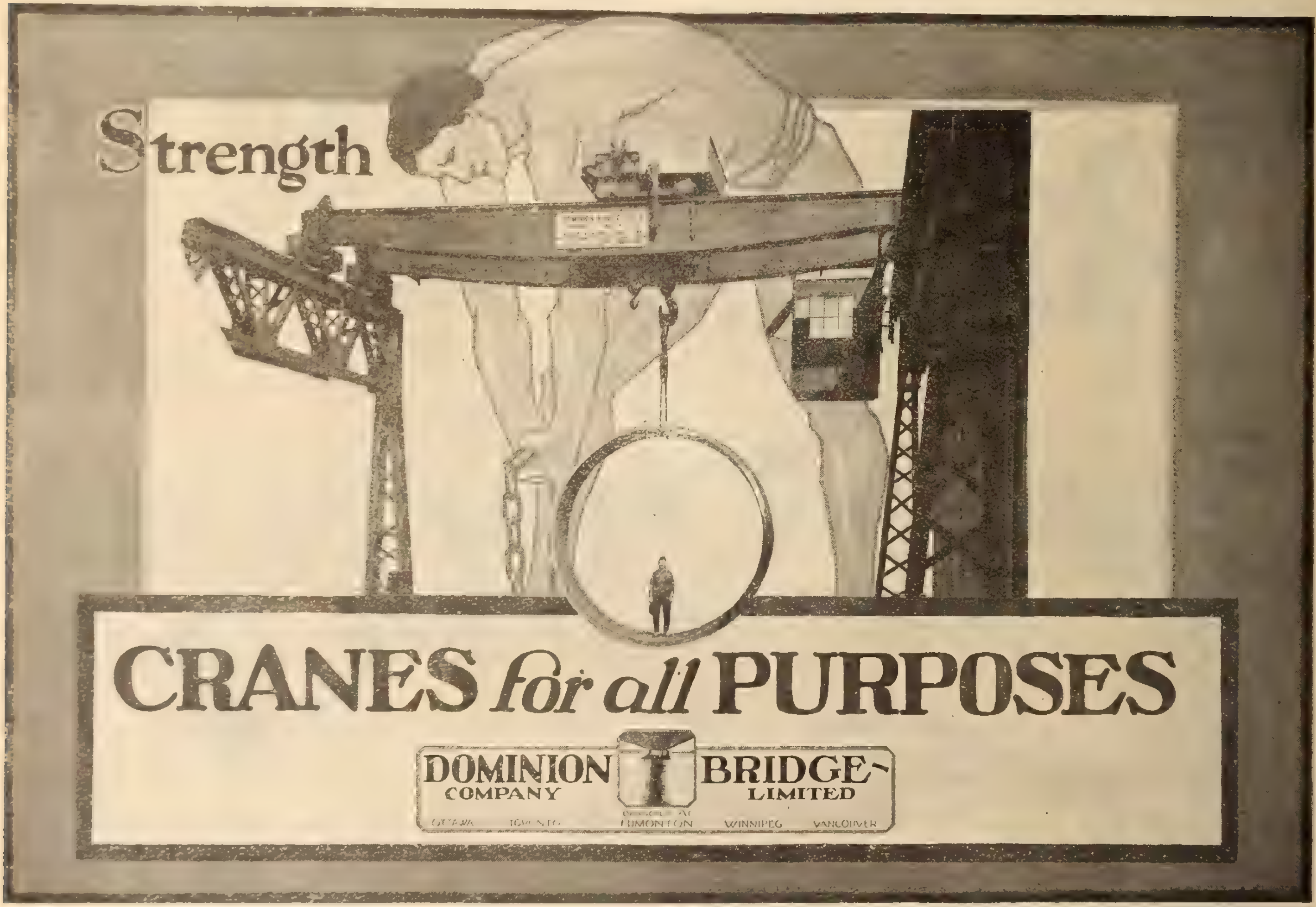

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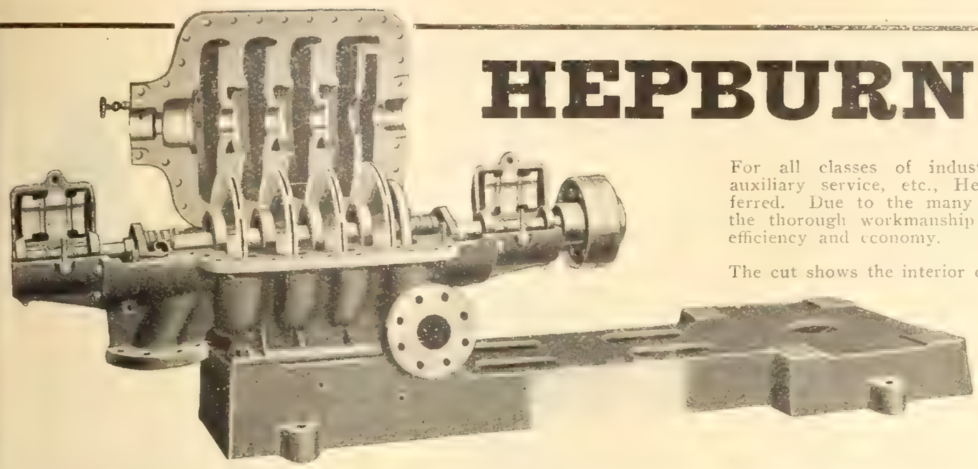

HEPBURN PUMPS

For all classes of industrial service, water works systems, fire auxiliary service, etc., Hepburn centrifugal pumps are to be preferred. Due to the many exclusive features in their design and to the thorough workmanship put into them, they are noted for both efficiency and economy.

The cut shows the interior of a 4-Stage Split Casing Centrifugal Pump.

John T. Hepburn
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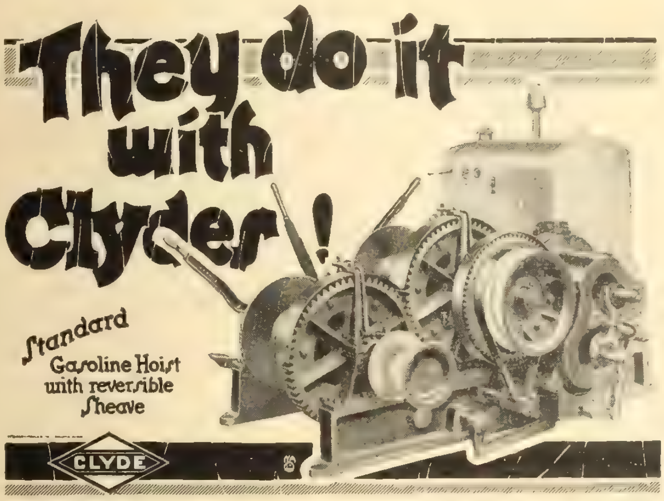

W. F. Creighton, president Foster & Creighton Co., Nashville, says: "We are very pleased with the two Gasoline Hoists; they are a step forward in building-industry equipment. *** One of these has been operating a double cage brick hoist and a concrete tower at the same time. This has never been equalled by and other type of engine we have owned."

A multiple cylinder engine with silent belt chain drive—easily portable by truck and unusually economical of operation. Write for details

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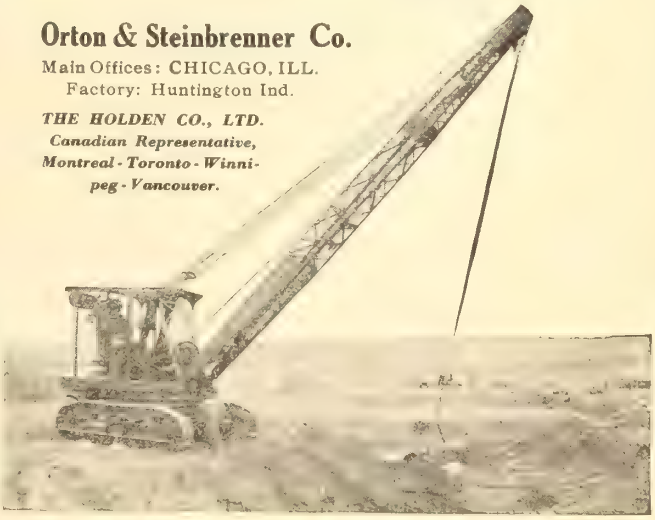

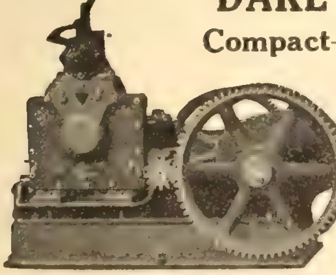

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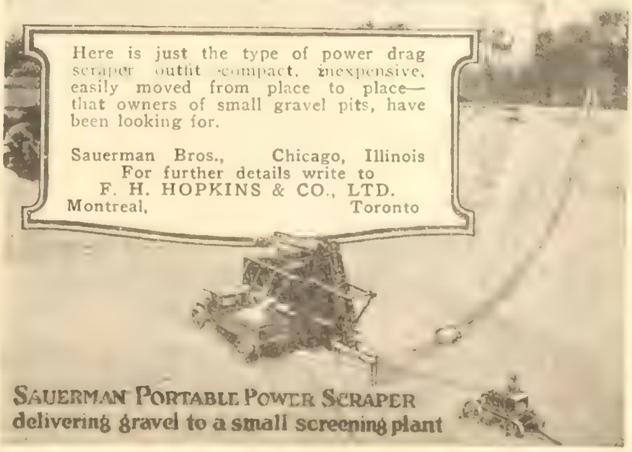

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Sauerman Bros., Chicago, Illinois
For further details write to
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SAUERMAN PORTABLE POWER SCRAPER
delivering gravel to a small screening plant

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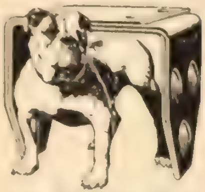

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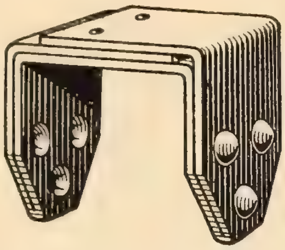

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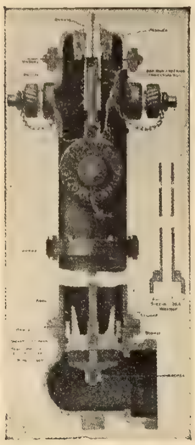

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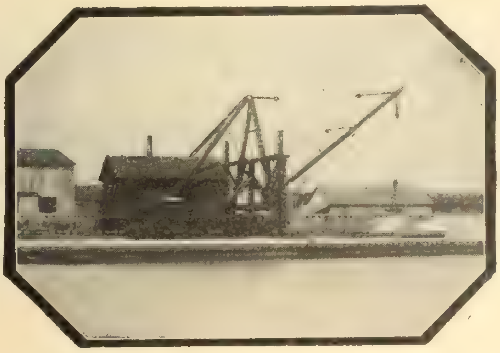

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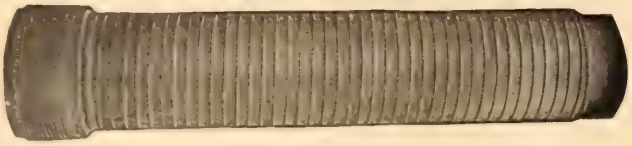

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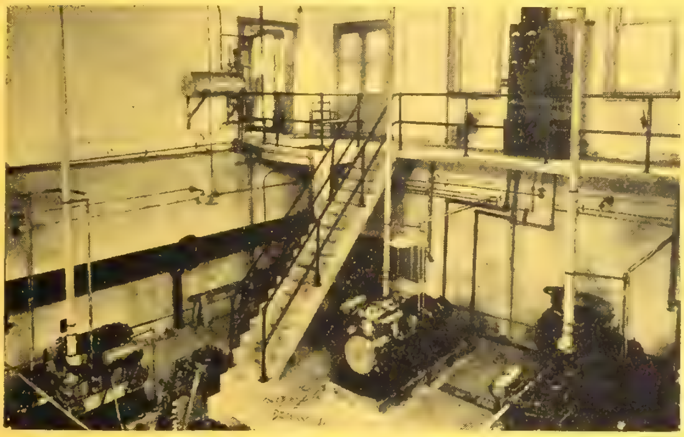

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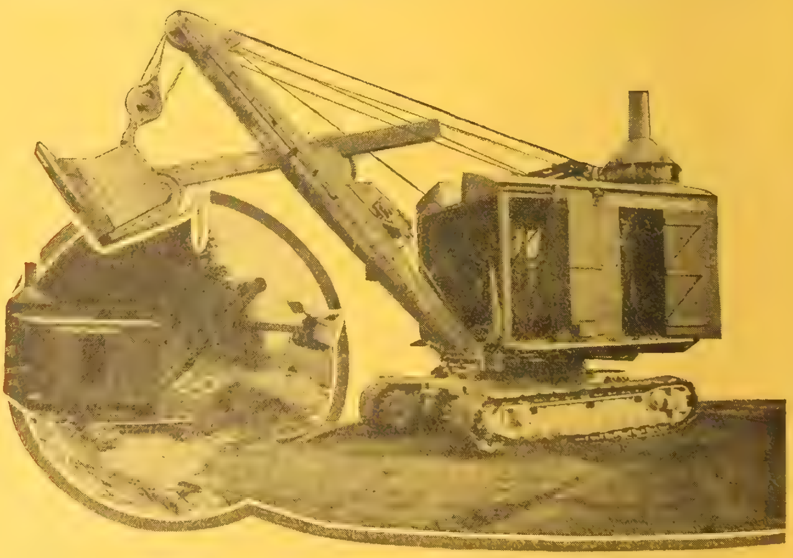

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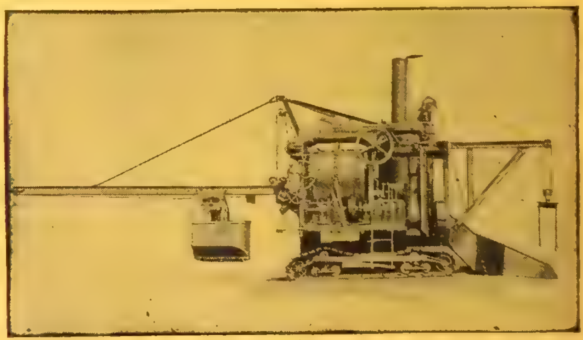

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Vol. 37 Toronto, August 8, 1923 No 32

Contract Record and Engineering Review

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Asphalt
PRODUCTS

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A view of our 36″ Continuous Stave

Wood Pipe

in the famous Capilano Pipe Line which, after serving Vancouver City faithfully for over 15 years, is still in its infancy.

C. S. Pipe
is used successfully for hydro - electric purposes up to 14 ft in diameter.

TANKS
and SILOS to Order
Any Size—Any Style

CONTINUOUS STAVE
Wood Pipe
or WIRE WOUND

YOU CAN NO LONGER RECKON WITHOUT WOOD PIPE

We have enthusiastic customers willing to assure you that recent improvements have so increased efficiency and durability as to place **Wood Pipe** on a plane with Cast Iron. These features at a low initial cost, combined with ease of transportation and installation, spell true **Economy.**

When writing for information and prices please specify diameter and pressure

Our Electric-Butt-Welded
STEEL
DOUBLE COUPLING
with Inside Ring
Galvanized

has entirely eliminated joint leaks and has perfected WIRE WOUND PIPE

Canadian Pipe Company, Ltd.

550 Pacific St., VANCOUVER, B. C.

TO introduce some new materials of construction favors must be asked and trials solicited. Vitrified Clay Pipe need ask no favors nor does it need to be put on trial. It is a proved material, its qualities are known, its endurance has been tested, its records stand.

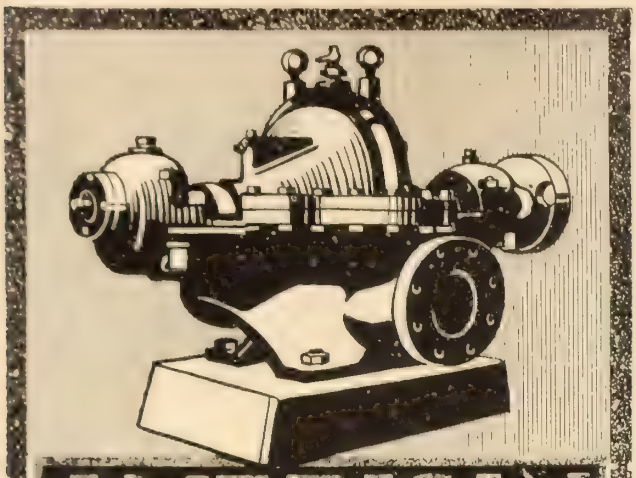
From Sydney on the Atlantic to Victoria on the Pacific it has been used throughout the Dominion in all kinds of soil and for all kinds of purposes. Over eight miles of 8" diameter Vitrified Clay Pipe has been used to drain off the alkaline ground waters which threatened to destroy the 8 feet diameter concrete aqueduct of the Greater Winnipeg Water District.

Vitrified Clay Pipe is not affected by alkali or acid. In many large industrial establishments it is used to carry waste waters which would destroy metal or concrete pipes.

No one can tell to what use in the future a sewer will be put. Factories invade the residential districts, storm water drains are converted into combined sewers and the only safe material to use is Vitrified Clay Pipe. The cities with the longest and widest experience of substitute materials are the strongest advocates of Vitrified Clay Pipe as the reliable and permanent material for the construction of sewers and drains.

Vitrified Clay Pipe Publicity Bureau

Toronto, Ont. **St. Johns, P. Q.** **New Glasgow, N.S.**



AMERICAN

TRADE-MARK REGISTERED U.S. PAT. OFFICE

Purchasers of American Well Works Pumps show their satisfaction by re-ordering!

Industries who used their first American Well Works equipment years ago, evidence their satisfaction by re-ordering today.

A half a century of pump design and manufacture is back of the American Well Works nameplate on centrifugal pumps, deep well turbines or deep well plunger pumps.

THE AMERICAN WELL WORKS

General Office and Works
AURORA, ILL.

Chicago Office
First National Bank Bldg.

FOR SALE

1—Model 20 Marion Steam Shovel on two 4 wheel Railroad Trucks 1¼-yard Dipper.

2—36″ Gauge Locomotives.

20—36″ Gauge 3-yard Cars.

1—No. 2 Thew Shovel on Railroad Trucks.

Eastern Equipment Co.
Limited

MONTREAL, QUE.
P. O. Box 792

DORVAL, QUE.

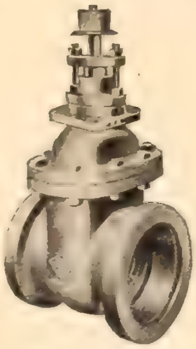


Fig. 400 F.M.

Regularly supplied to open by turning to the left. Can be furnished open to the right if desired.

This is Type "K" Jenkins Iron Body Standard Gate Valve

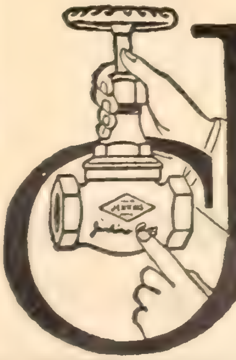
For Use With Indicator Post

Non-rising Spindle. **Hub Ends.**

Approved by the Fire Underwriters and, like all genuine Jenkins Valves, made to function satisfactorily under the strain of severe service.

You'll find this valve fully described in JENKINS Catalog No. 9—free on request.

JENKINS BROS. LIMITED,
Head Office and Works: 103 St. Remi St., Montreal
Sales Offices: Toronto — Vancouver
European Branch: 6 Great Queen St., Kingsway, London, W.C. 2, Eng.
Factories: Montreal, Bridgeport, Elizabeth



Always marked with the "Diamond"

Jenkins Valves

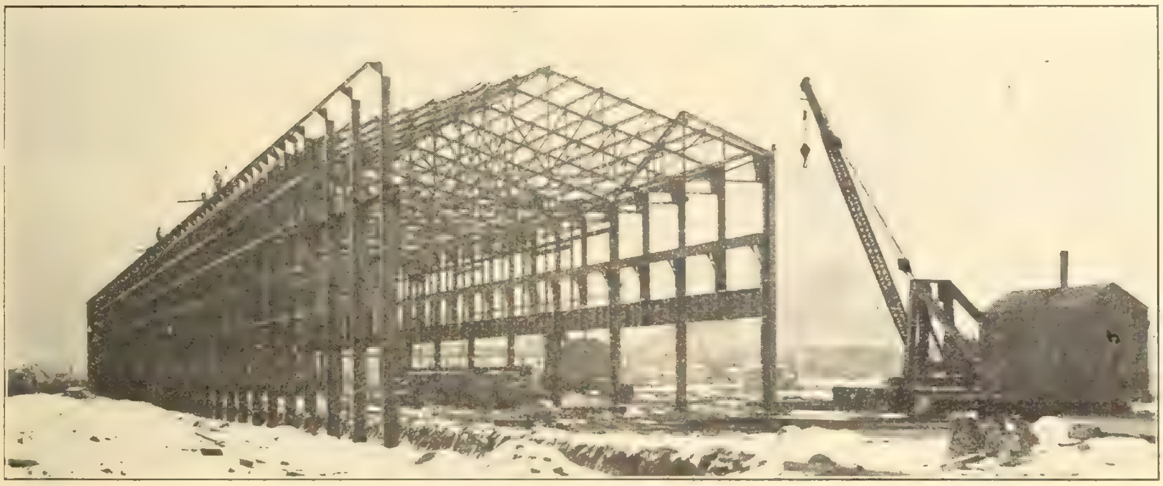
SINCE 1864

BUILD IN THE WINTER

with

Structural Steel

IT PAYS!



Structural Steel is particularly well adapted to winter construction as indicated by the rapid progress of erection of the new Ford Building at Ford, Ontario.

The machine shop which is 1088 feet long by 570 feet wide was commenced on November 15th, 1922 and all steel completed by May 25th, 1923. The building contains 5100 tons of structural steel.

Build with

STRUCTURAL STEEL

Issued by the
Structural Steel Association

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The following regulations apply to all advertisers:—Eighth page, every issue, three headings; quarter page, six headings; half page, twelve headings; full page, twenty-four headings

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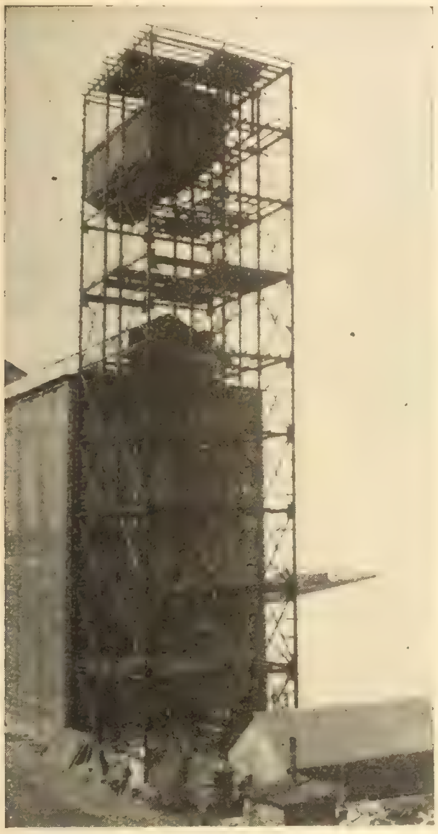

The Hamilton Bridge Works Company Limited

Head Office and Works: Hamilton, Canada
Branch Office, 410 General Assurance Bldg. Toronto, Canada

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Engineers, Manufacturers and Contractors

Steel Railway and Highway Bridges, Buildings, Girders, Crane Runways, Towers, Turntables, Trusses, Columns, Mine Buildings, Head Frames, Bins and other plate work.

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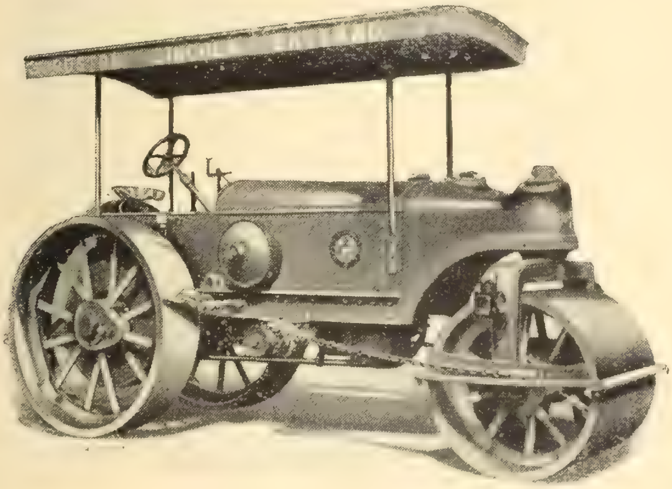

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Instant Reversing without changing Gears.

No Smoke.

No Boiler to clean.

Three Travelling Speeds in either direction.

Easy to handle.

Let us send you catalogue.

RUSTON & HORNSBY LTD.
Lincoln, England

Agents—

LAURIE & LAMB, Board of Trade Bldg., MONTREAL

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They've Owned Seven Buckeyes

"and have always had more work from these machines than they were guaranteed to do," say Herr Bros., Piper City, Ill.

Another Buckeye booster says he "chose a Buckeye after expensive experience with other types of excavators"—and he's down in Oklahoma.

"Paid for itself five times", writes another enthusiastic owner.

"Costs less to operate—and we've used them all"—Thos. McHugh, Lima, Ohio.

Buckeye owners are continually telling us how their Buckeyes turn out big yardage at low cost in hard shale and sticky clay. And they're loud in their praise of the **toughness** of these sturdy trench diggers.

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We showed it, demonstrated it, told the plain facts about other people's experience with it. They became more and more interested, spent the afternoon with us and finally bought a

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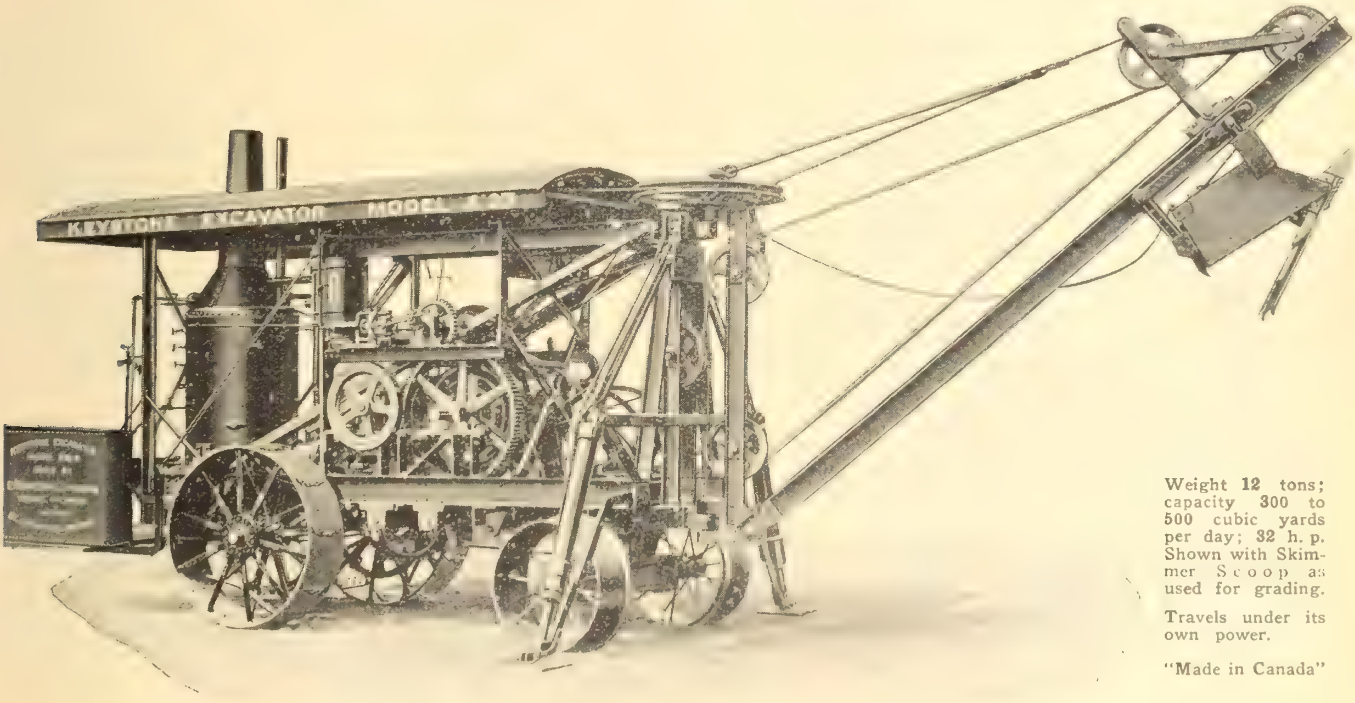

Weight 12 tons; capacity 300 to 500 cubic yards per day; 32 h. p. Shown with Skimmer Scoop as used for grading.

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New 8" NATCO Multicell Tile Unit showing dovetail method for gripping stucco on exterior and plaster on interior.

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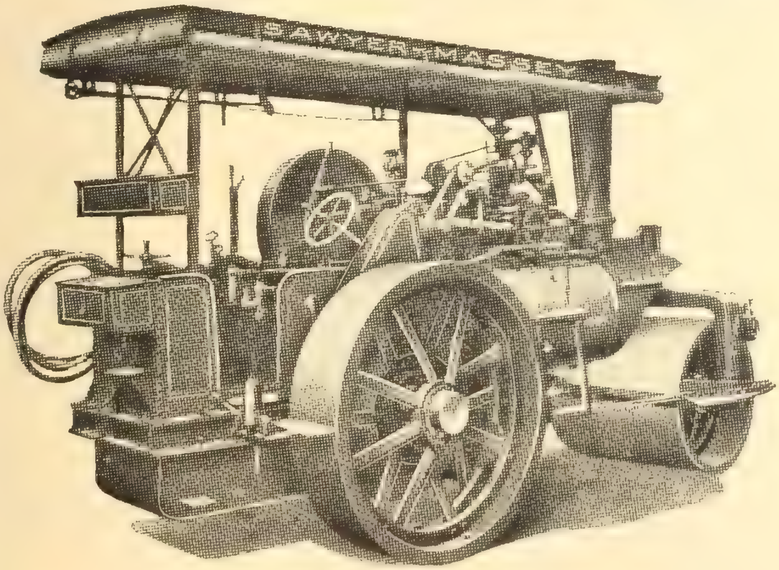

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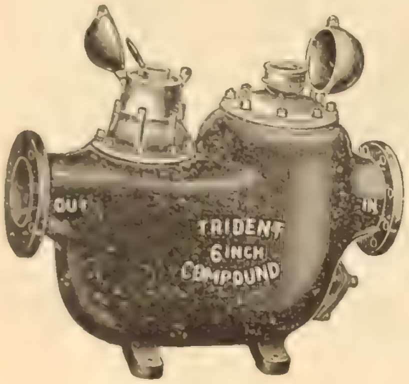

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This is the ideal meter for use on variable-demand lines because it registers accurately the peak as well as the off-hour flow. The Trident Compound is designed and built as a single unit and operates as such, eliminating the difficulties and troubles which accompany the coupling of two individual meters under one housing. The increased revenue this meter brings in will pay for its initial cost in a short time.

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As Handy as a "Jackhamer"

The truth of this often repeated phrase is well illustrated by the above photo which shows eleven Ingersoll-Rand "Jackhamers" drilling the benches in a 36 x 4500 foot tunnel at Niagara Falls.

Such work is usually done by heavy mounted drifters. "Jackhamers" were chosen because it only requires a few seconds to put them in cradles for drifting or remove them for drilling the benches.

The word "Jackhamer" is the world-wide registered trademark for a complete family of "Ingersoll-Rand" all-steel, hand hammer drills ranging in size from the 21 lb. "BAR-33" type to the 70 lb. "DDR-13" "Jacksinker."

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I am sending you a few words of praise concerning the fireproof and water resisting properties of your famous Gypsum Board. My house caught on fire on May 25th, and the upper part was severely burned, but the lower part was saved, thanks to a new ceiling of Gypsum Board, which no fire penetrated. Water laid on it for seven hours, and the Gypsum Board ceiling is none the worse for its trying experience. A part of a Gypsum Board I had left over was in a cupboard with some spare furniture and clothes, all were burnt to ashes, except the "Gypsum Board" which was only discoloured by the flames and smoke. Many people have been in to view this same ceiling before and after the fire and are wonderfully pleased with it. I am rebuilding now, and it shall be all Gypsum Board and safety for me.

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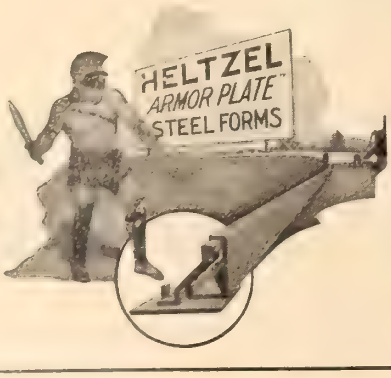

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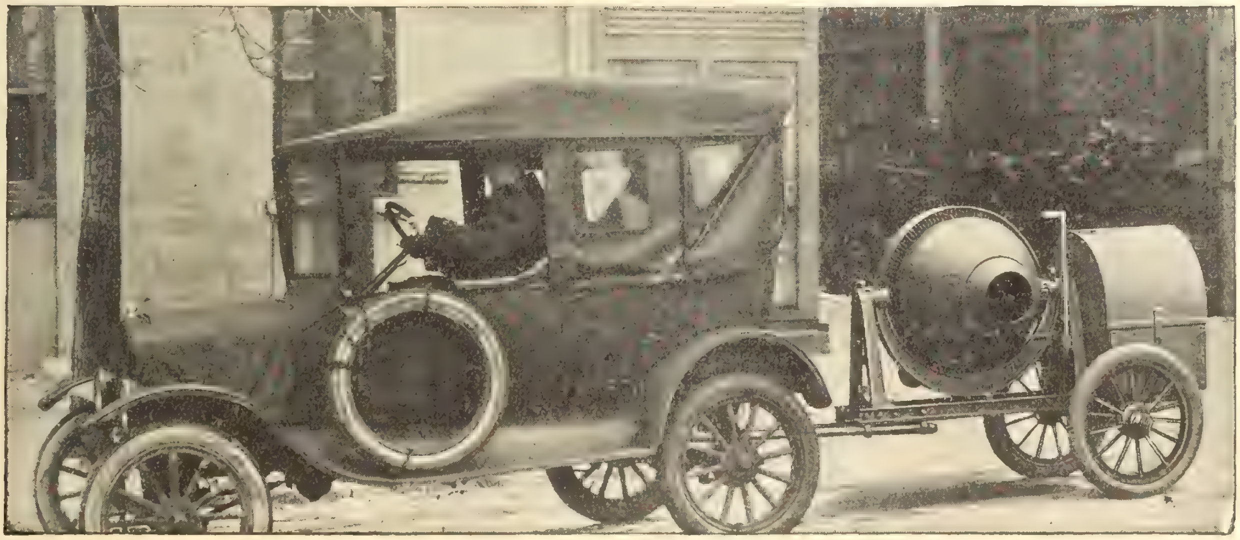

You can have it on two wheels to haul behind your car or on four wheels, as desired.

You should have one of these machines for your smaller jobs.

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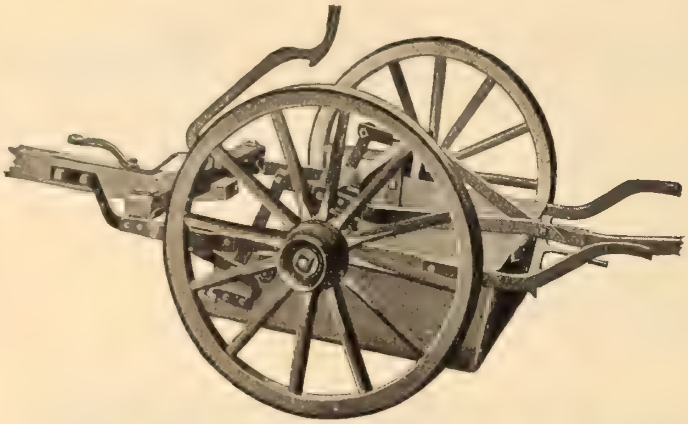

Western Standard Wheeled Scraper will serve you many seasons

The grading contractors of Canada generally recognize the superiority of Western scrapers, plows and road graders. They are scientifically designed and are very strong and durable, being made of special steel. They will outwear other competing tools. The cost of upkeep is the important thing. Nothing will so eat into profits as poor broken down tools on the job. A special tool has been devised to meet the requirements of gravel road maintenance under traffic. It is a standard Little Western steel grader with scarifier attachment.

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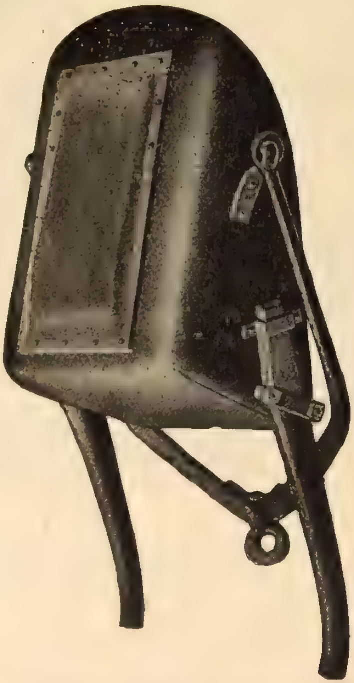

Western Dragscraper, note the durable bottom

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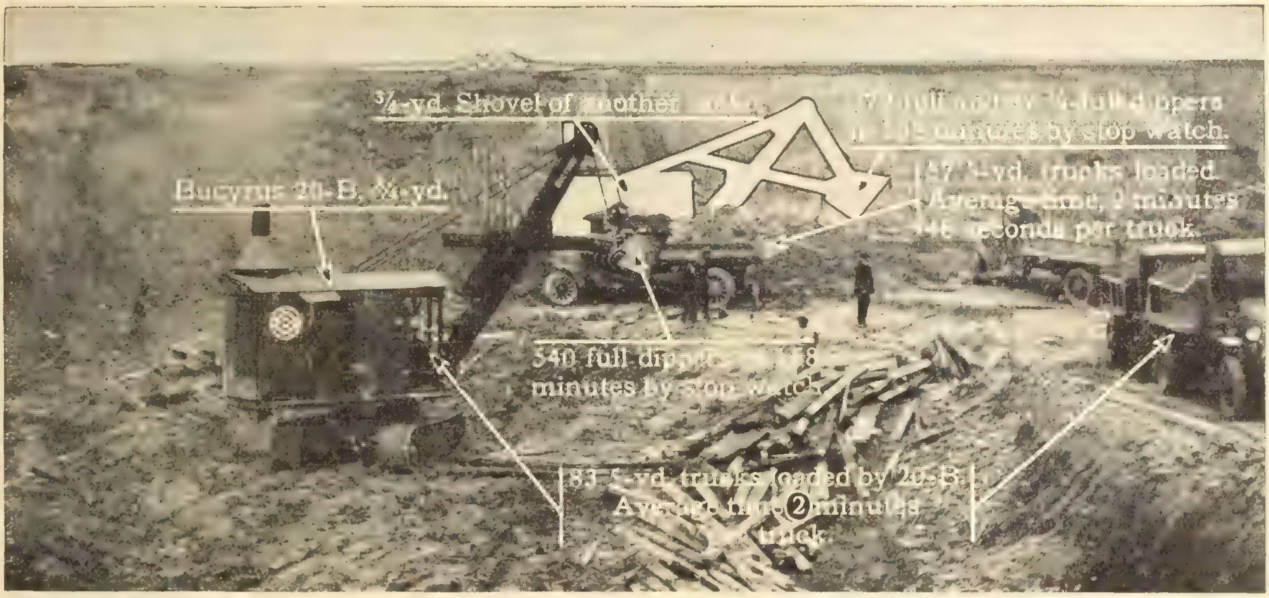
It Was an Average BASEMENT JOB—

and they were short of trucks — for long periods the shovels sat pretty, popping off into the air, waiting — when trucks showed up the shovels gave them all they had, to keep things moving. There were two of them, a Bucyrus 20-B and another make of the same size; the conditions were identical, operators expert, material packed sand—

Here Is What Happened—


¾-yd. Shovel of another [illegible]
[illegible] full [illegible] ¾-full dippers in [illegible] minutes by stop watch.
37 5-yd. trucks loaded. Average time, 9 minutes 46 seconds per truck.
Bucyrus 20-B, ¾-yd.
540 full dippers in 18 minutes by stop watch.
83 5-yd. trucks loaded by 20-B. Average time ② minutes per truck.

On hundreds of jobs like this contractors are looking for the shovel that can outdig the other shovel — THE SHOVEL WITH SPEED — they've got just that in the 20-B.

HERE ARE FIVE REASONS WHY:

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20-B — ¾-yard. 30-B — 1, 1¼-yard.
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Send for Bulletin **C-D** and state which size you are interested in.

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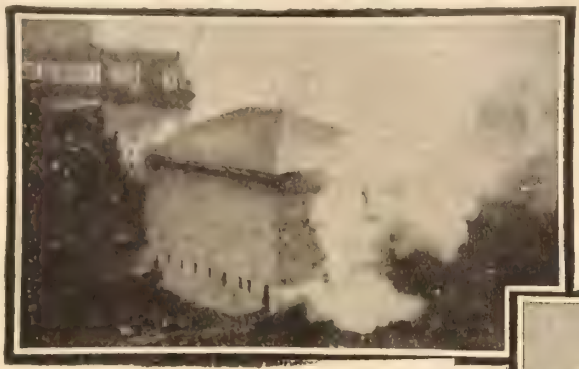

Concrete Block Building as it appeared 20 minutes after fire was lighted. Water being applied

Appearance of Concrete Block Building after fire was completely extinguished

CANADA CEMENT
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Concrete Materials Put to a Supreme Fire Test

An interesting demonstration of fire-proof home construction was arranged by the Concrete Products Association of Minnesota.

A house was built of Concrete Block, with Cement Stucco surface, Cement Asbestos Shingles, and Concrete Sills and Lintels.

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Although the fire was extinguished by a heavy stream of cold water applied to the intensely hot walls, close inspection of the interior disclosed the fact that not a single crack was in evidence in either the Block, or Concrete Sills and Lintels. The only parts of the building damaged at all were the Doors and Window Frames of wood.

This test, and its remarkable result, serves to emphasize the sound structural qualities of Concrete Block Stuccoed. The Concrete Block gives strength and permanence. The Stucco lends beauty and charm, in addition to being weather-proof, fire-proof and rot-proof.

When it is considered that the walls of this fire-tested dwelling were only ten days old, and the Stucco and Plaster only three days old, the results of the demonstration are truly significant.

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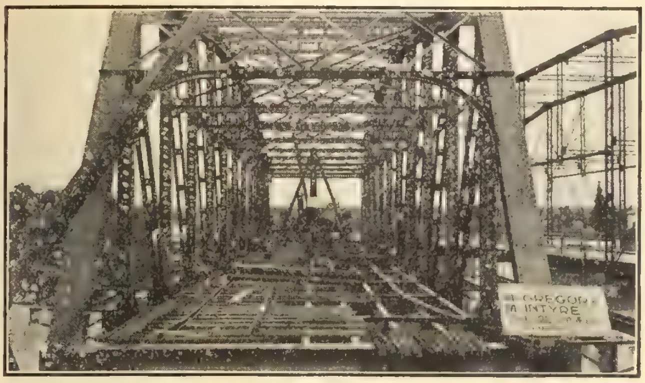

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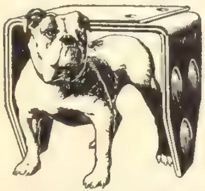

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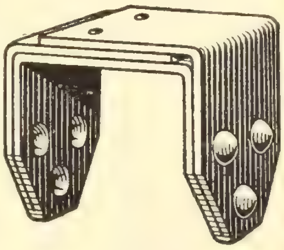

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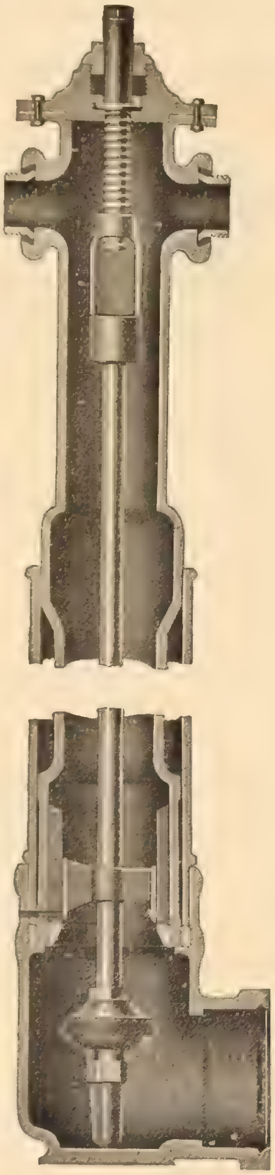

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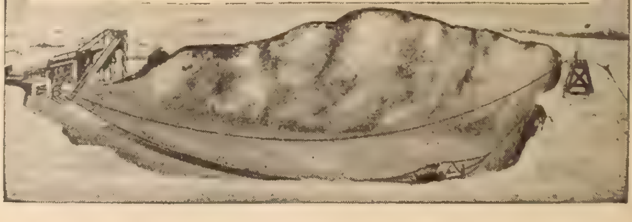

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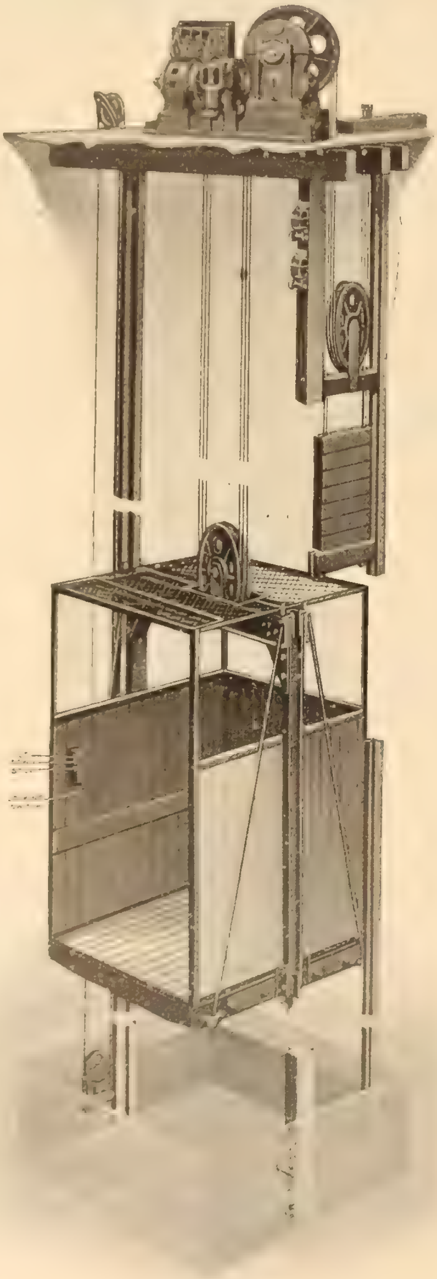
We should like you to have our new booklet—"Push-Button Freight Elevators"—on file. Your request will bring one by mail. It is just off the press.



CONTROLLED as easily as an electric light—"Just push the button."

Safe! Car cannot be operated unless all gates are closed. Gates cannot be opened unless car is at landing.

The low initial cost and economy of upkeep will commend this Push-Button Freight Elevator for the moderately small installation. Its positive operation and continuous efficiency will also guarantee supreme service for larger requirements where heavy duty and constant operation are essential.

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Seasonal Construction

One of the chief bugbears in the building and construction industry in Canada is the shortness of the season. It not only affects labor, but it means that the overhead of the contractor must be unduly heavy. Equipment of all kinds operating only six or seven months of the year, at most, his office charges have to be carried for the twelve months and, in general, the cost of building is considerably higher than it would be if operations could be carried on the year round. In the United States the same condition exists, though being in a more southerly latitude the "off" period is naturally shorter. However, they are investigating the possibilities of improving conditions there and have appointed a Government Committee to look into the matter and see what can be done. Discussing this subject the Members' News Letter of the Associated General Contractors of America makes the following comment:

"Savings, not only to the building industry and its workers, but to the public generally are expected to result from the activities of a committee on seasonal operation in construction industries, the appointment of which, by Herbert Hoover, chairman of the President's Conference on Unemployment, has just been announced by the Department of Commerce. This saving should be reflected in lower relative costs of dwellings and other buildings.

"Previous surveys have indicated that most construction activity is concentrated in seven to ten months of the year, which means that building trades workers cannot find work in their trade during several months and that contractors' organizations and equipment, architects, engineers, building material-producers, and others connected with construction must usually remain idle for similar periods. This idle time represents waste and direct losses to the construction industries themselves, their workers, and the public.

"The committee was formed in the hope that by examining the facts and proposed remedies it might be able to suggest sound solutions and obtain general co-operation in effecting them. It is the general impression that seasonal building has been due perhaps more to custom than to weather, and it is expected that the investigation will throw light on this and other important points."

Specifying Canadian Building Materials

With the idea of encouraging the use of Canadian building materials the Ontario Association of Architects have made the suggestion that a committee of architects confer with a committee representative of the producers of building materials, for the purpose of establishing the merits of Canadian products. The Canadian Manufacturers' Association have approved of the idea and addressed to those of their members who may be interested the following letter which explains the suggestion more fully:

Toronto, July 23rd, 1923.

To the members of the Ontario division interested in the production of building materials:

Dear Sir:

That Canadian architects should specify Canadian materials whenever possible has been urged by the Association for a long time, and it is gratifying to report that, especially during recent years, architects have done a great deal to increase the volume of Canadian products used in construction.

It is now proposed by the president of the Ontario Association of Architects that a committee, representative of the producers of building materials, be organized to confer with a committee of architects, for the purpose of establishing a method of co-operation through which architects could be readily referred to all classes of products which enter into the installation of buildings.

The proposal contemplates amongst other things:

(a) Making of advertising a medium for convey-

No. 93

Canada's Engineers—J. Paul Joncas

Mr. J. Paul Joncas, M.A., Laval University, Quebec, was born in 1883 at La Grande Riviere, County of Gaspe. After completing his classical studies at the Quebec seminary, Mr. Joncas entered L'Ecole Polytechnique, of Montreal, where he graduated in 1908, winning the diploma of Civil Engineer and the degree of B.A. Sc. Mr. Joncas has been employed during his vacations on the location and construction of the Gaspe and National Transcontinental Railways. In 1909 he passed the examination for the practice of land surveying in the Province of Quebec. Since graduation, Mr. Joncas has been practicing at Quebec, first with the firm of Tremblay & Malouin, and later, to date, as head of the firm of Joncas, Malouin & Rousseau, engineers and surveyors. Since 1909 he has been professor of land surveying, hydraulics and construction at the Land Surveying and Forestry Schools of Laval University, of which schools he is a director since 1919.

Mr. Joncas has been engaged in numerous important engineering works which include municipal construction and surveys of water powers in connection with forestry exploitation. He has also made extensive surveys of the larger tributaries to Lake St. John together with the establishment of several survey base lines in the southeastern and northern parts of the Province and in these latter works is included the re-survey of part of the Interprovincial Boundary lines between Northern Ontario and Quebec.

He is consulting engineer for the City of Quebec; an Assoc. Mem. of the Engineering Institute of Canada; one of the directors of the Corporation of Quebec Forestry Engineers and a member of the Association of Professional Engineers of Quebec.

Mr. J. P. Joncas

ing to architects authoritative information with respect to the products they may use.

(b) Reducing the cost of selling to architects.

(c) Securing through architects market recognition of the quality of all products.

(d) Insuring the proper use of the product.

(e) Standardization in advertising material to permit of filing under standardized filing systems.

The Ontario Association of Architects will meet in Windsor in September and a committee representative of the producers is invited to attend. Manufacturers of building and construction materials interested in this proposal are asked to communicate with the undersigned so that, if necessary, a meeting may be convened and a committee organized.

Yours faithfully,
J. M. McINTOSH,
Secretary, Ontario Division.

GEO. BRIGDEN,
Chairman, Ontario Division.

[Editor's note—Something of this sort has been done by the American Institute of Architects through their Structural Service Committee, who have made available to the members of the Institute impartial and authoritative information regarding building materials. The idea back of the suggestion referred to in the above letter is similar in that scientific and unbiased data relating to Canadian products be compiled so that architects may determine if their requirements can be met by the use of some Canadian material that is serviceable and reputable.]

Tenders on Edmonton School

The following figures were recently received in connection with tenders submitted for Garneau school at Edmonton, Alta.:

General

Pheasey & Batson Ltd., Edmonton (accepted)	$121,049.00
Bennett & White Constr. Co. Ltd., Calgary	144,350.00
Carter Halls Aldinger Co. Ltd., Edmonton	142,353.00
J. R. Desrochers, Edmonton	140,224.00
J. Dunlop, Edmonton	142,000.00
T. Ingram, Edmonton	139,902.00
Thos. Jamieson & McKenzie, Ltd., Calgary	141,000.00
H. G. MacDonald, Edmonton	141,141.00
J. McDiarmid Co. Ltd., Winnipeg	130,300.00
Poole Constr. Co. Ltd., Edmonton	123,985.00
L. F. Toby, Edmonton	140,902.00

Plumbing and Heating

H. Kelly & Co. Ltd., Edmonton (accepted)	51,625.00
C. R. Frost, Edmonton	52,835.00
Ideal Plumbing Co., Edmonton	52,137.00
S. J. Jennings, Edmonton	47,465.00
Hockerbie & Hole, Edmonton	52,337.00
Standard Plmg. & Htg. Co. Ltd., Edmonton	53,147.00
Templeman Bros., Edmonton (plmg. only)	15,197.00

H. Collier, London, is building two stores with apartments, on Elmwood Avenue, London. Plans were prepared by C. A. Vanderlande, 1023 King St., London, who is also superintending the construction.

Rapid Progress on Toronto Breakwater

An Interesting Piece of Marine Construction Protecting 3½ Miles of Shore—Consists of Pre-Cast Concrete Blocks on Rock Filled Cribs, Capped with Mass Concrete

For some years improvements to the Toronto harbor and lake front have been carried out by both the Toronto Harbor Commission and the Department of Public Works of Canada. This work has comprised the building of new docks and port facilities in the inner harbor; the reclaiming of Ashbridge's Bay, east of the harbor, and its conversion into a desirable industrial site; the provision of water frontage for this area by the construction of a ship channel and turning basin; and the protection of the shore of Humber Bay from the Western Gap to the Humber Bay by a breakwater extending for nearly three and a half miles along the water front.

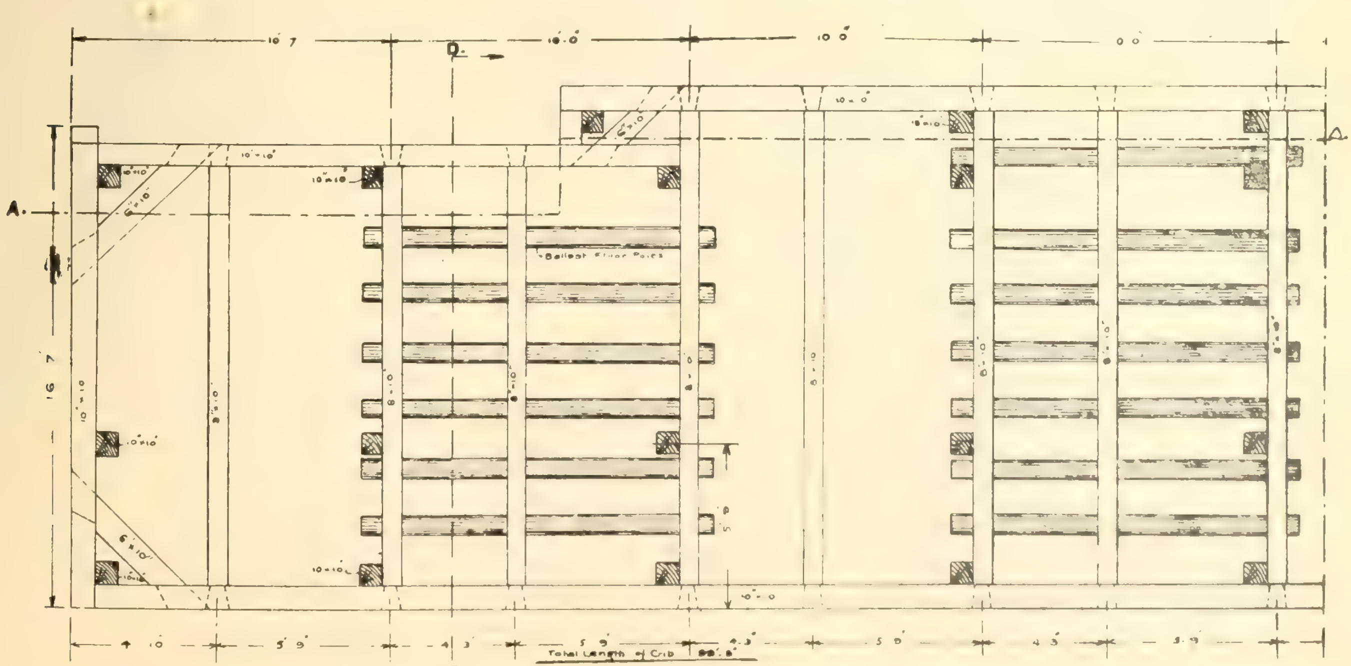
The last two items of this program—the construction of the ship channel and the Humber Bay breakwater—are under the direction of the Department of Public Works of Canada. Progress on them has been regularly maintained and very shortly the work will be completed. Several articles in the Contract Record have described special features of the construction; of special note are the articles in the August 27, 1919, and October 22, 1919, issues in which details of the breakwater and ship channel respectively, were given. Since that time the turning basin, 1,100 ft. square, at the eastern end of the ship channel which is 400 ft. wide by 6,800 ft. long has been completed and the bottom dredged to a depth of 24 ft. In brief, the work comprised the construction of mass concrete quay walls on timber pile bents filled with sand. The timber work is anchored to anchor piles driven fifty feet from the face of the wall. The concrete wall, of stepped design, reinforced at the face, was poured in three lifts in 40 ft. sections alternately. The progress of the timber construction and the placing of the mass concrete in the turning basin was much facilitated by the construction of a cofferdam across the ship channel, enabling the lowering of the water to the cut-off level of the piles. For further details of this work the reader is referred to our issue of October 22, 1919. The construction carried out since then has been similar in design and execution.

Progress on Breakwater

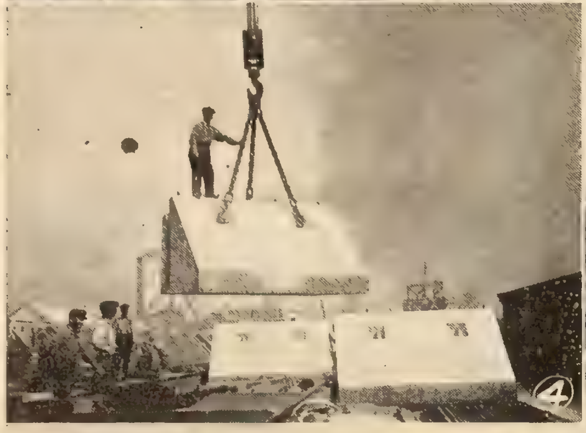
Since our issue of August 27, 1919, in which the western shore protection was described, very considerable progress has been made in extending this breawater, which, as before referred to, is being installed to give protection to the water frontage extending from the Western Channel of Toronto harbor to the Humber River, a distance of 3½ miles.

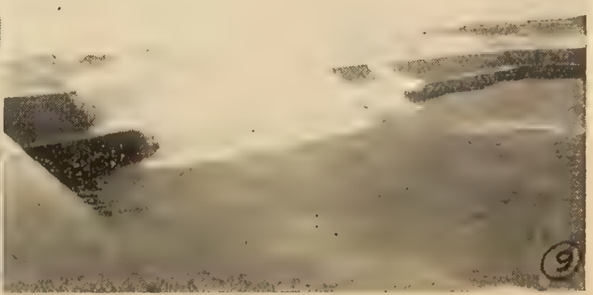
As may be seen from the accompanying location plan, the general trend of the breakwater follows a line parallel to the shore and its purpose, in the main, is to prevent erosion of the very extensive hydraulic fill, which has been placed by the Toronto Harbor Commission.

As may be seen from the general plan, the breakwater consists of thirty-one sections, the majority being 560 ft. long, each with 100 ft. gaps between. This arrangement is slightly different from the one first determined upon and illustrated in connection with the article in the August 27, 1919, issue The substructure consists of cribs of 16 ft., 18 ft. and 20 ft. base, having 10 inch walls, 8 x 10 in. cross ties, and filled to the cap level with rubble stone varying from 4 to 12 in., each crib being sunk in position in a trench dredged to a depth of approximately 17 ft. below elevation 245.00. The cribs are built up in a yard at the foot of Spadina Avenue and floated to place upside down. When the site is reached, the bottom of the crib is cut to conform accurately to the contour of the rock which is determined by taking soundings at close intervals over the area to be cov-



Sectional plan of an 18-ft. crib such as is used in the western breakwater, Toronto harbor improvements

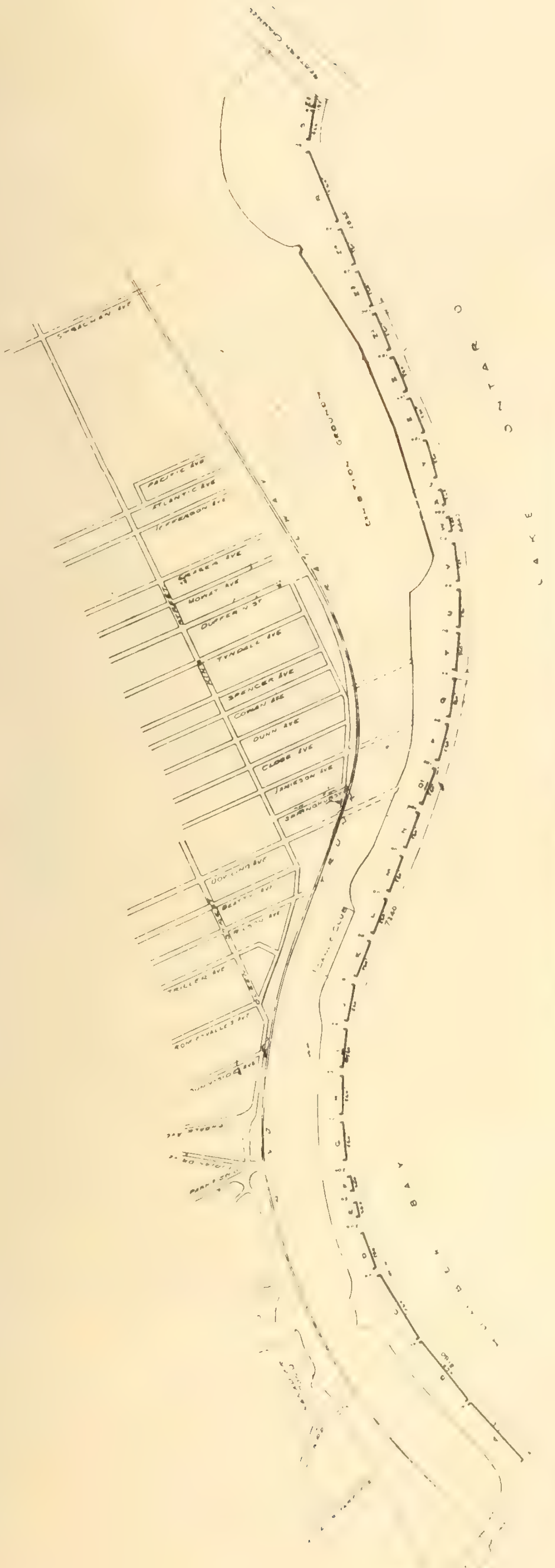




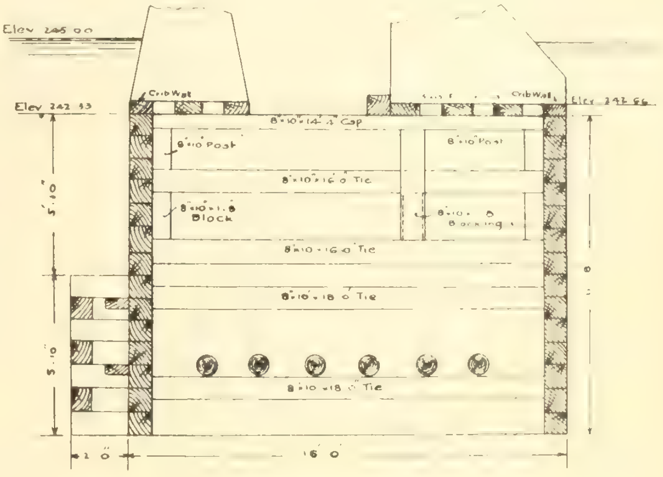
Western breakwater, Toronto harbor improvements—Figs. 1, 2, 3 and 4—Scenes in the plant where the concrete blocks are cast; Figs. 5 and 6—Views of the contractor's dredge and scow equipment; Figs. 7 and 8—Sections of the completed breakwater; Fig. 9—How the wall breaks wave action ered by the crib. When righted and sunk it then has a firm bearing on the rock, the accuracy of position being determined by a diver. The rubble fill is then placed by means of scows and floating derricks.

Manufacture of Blocks

The superstructure consists of concrete blocks and mass concrete finished to elevation 250. Details are shown in accompanying drawings. The blocks are built in the Spadina Avenue yard by methods which were fully described in the Contract Record of July 9, 1919. A brief review of the scheme follows. The yard is located right on the water front with a slip on the east side and open water on the south. Parallel with the face of the slip dock, forms for 35 pairs of blocks are provided, each pair comprising a front and back block, details of which are shown in the drawings. An elevated tramway erected between the front and back series of blocks facilitates the pouring of concrete which is delivered into hopper cars at the mixer which has a capacity of a cubic yard per batch. Two cars operate together, one discharging on one side for the front blocks and the other on the opposite side for the rear blocks. The forms are permanent, a firm base being secured by capped piles at 10 ft. centres, supporting heavy flooring. After six days' curing the side and end forms of each block are removed and the blocks transferred to scows by means of a traveller which operates on a track par-



Location plan showing the western breakwater, Toronto harbor improvements



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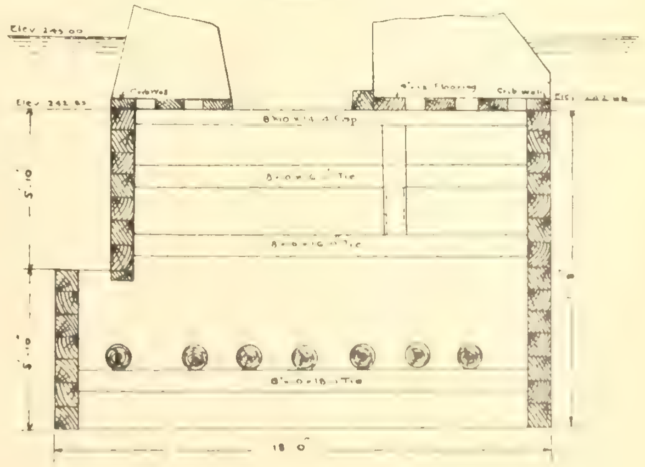

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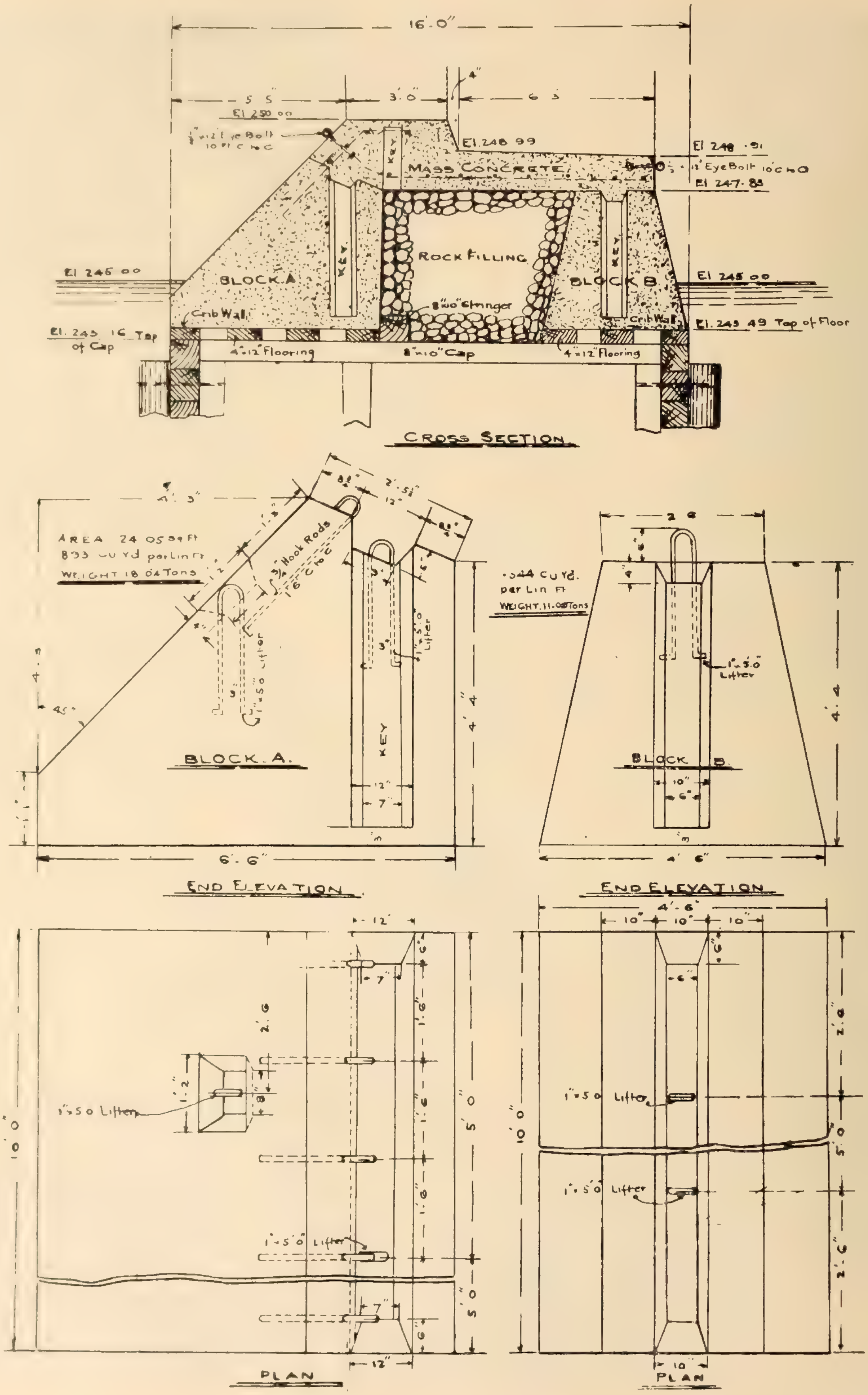
Sections of the crib work



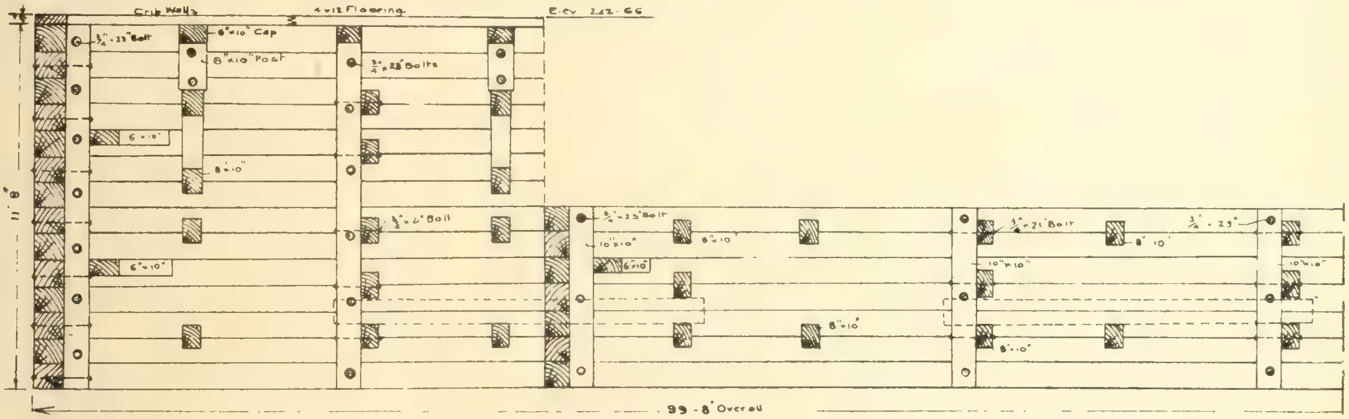
Details of the concrete pre-cast blocks

allel to the line of forms. The pouring of 70 blocks constitutes a day's run.

When the blocks are transported to the site of the breakwater, they are handled from the scow by a dredge which has been converted for the purpose. Provision is made for carefully aligning the blocks when they are set in place on the cribs. The front and rear blocks weigh 18 and 10½ tons each respectively.

After the blocks are set in position, the rock filling is placed and the mass concrete top poured. Details of this are shown in an accompanying sketch.

During 1921, some 6,265 lineal feet of cribs were sunk in position, as well as the cutting off of 6,000 post in readiness to receive cap timbers which form the base upon which the concrete moulded blocks are placed. In 1922, the length of cribwork sunk was 2,240 lineal feet or a total of 8,505 lineal feet requiring some 68,000 tons of rubble for filling cribs and superstructure. Concrete blocks and mass concrete top placed during the season 1922 amounted to 5,560 lineal feet, equal to 11,954 cubic yards. Crib timber used amounted to 4,647,532 f.b.m., while 493,000 lbs. of reinforcing steel were used.



Longitudinal section of an 18-ft. crib for the western breakwater, Toronto harbor improvements

Construction Force Well Organized

In a work of this kind entailing, as it does, construction under varied conditions of weather and water elevation, successful operation depends almost entirely on method and organization. In the present instance, the engineering forces and the contractors have co-operated in all possible ways to secure efficiency in the use of the very extensive plant employed, the output per unit, and perfection of the work produced.

Thanks to these methods, the results have been entirely satisfactory; the completion of cribwork sections, the moulding placing and lining in of blocks, the erection and dismantling of forms, and pouring the mass concrete have proceeded in their proper rotation with something of military precision.

The contractors for the work, which is being carried out on a cost plus basis, are Messrs. Roger Miller & Sons Limited, Toronto. The contract has been under the constant direction of the staff of the Department of Public Works of Canada, of which Mr. Frederick H. Hand is the superintending engineer in charge.

New Sand and Gravel Concern Aims to Produce Quality Product

The Greenburn Sand & Gravel Co. Ltd., organized early this year under the Ontario Companies Act, has purchased the property and plant formerly owned by W. P. Godson at Greenburn on the Canadian National Railway, about 20 miles north-east of Toronto, and is getting into a position to render first class service to the construction industry. The material in this pit is of very excellent quality, the sand especially having already gained somewhat of a local reputation as a concrete sand. The present plant, which is in operation, is producing washed and sized sand, pea gravel, 1 in. and 2 in. gravel considerably above the average in quality, but the company plan to further improve the plant as opportunity offers without interfering with production, so that their product will be second to none.

Mr. G. A. McLeod is manager with his office at 33 Adelaide St., West, Toronto. He has had considerable experience in construction work since first entering the field on G. T. R. construction in 1907. From 1908 to 1913 he was connected with E. F. & G. E. Fauquier, who built several hundred miles of the National Transcontinental Railway in Northern Ontario. Maintaining his connection with these interests, he was assistant to the manager of Foley Bros., Welch, Stewart & Fauquier, on their contract for the construction of the piers in connection with the Halifax Ocean Terminals scheme, from its beginning in 1913 until its completion.

During the past five years he has organized and headed a sand and gravel business, a crushed stone business, and a construction company in Halifax, all of which are in successful operation and with which he is still connected. He also became a partner in a Halifax firm of manufacturers' agents which has its connection principally with the building and construction industry. Halifax interests are connected with him in the present Toronto undertaking.

In returning to his native province, Mr. Mcleod has chosen a field with which he should be thoroughly acquainted, and in which he will have a sympathetic understanding of contractors' material problems.

How Should Specifications be Written?

William F. Wischmeyer in an Address Before the Illinois Society of Architects Tells What Should and Should not be Included in These Important Documents

I know of no subject of more vital interest to the profession, nor one that is approached from so many different angles, than the production of specifications. I shall endeavor to tell you as briefly as possible what I have gained from my experience as chief draftsman and specification writer in the offices of Mauran, Russell & Crowell, and as an estimator and building superintendent in the offices of James Stewart & Co.

I am going to talk on specifications from the viewpoint of a contractor, estimator and sub-contractor, who must estimate on them, as I feel that very few architects are able to obtain this viewpoint unless they have had actual erperience in this work. My idea is to bring out the real value of the specification after it leaves the architect's office.

In the contractor's office the estimators call specifications "the vaudeville side of architecture" because of the humorous expressions contained in them. The estimator invariably makes notes of the contradictory things he finds and with his friends gets together and has a good laugh over them.

What Is a Specification

First of all, what is a specification? Most specification writers define the documents as a description of materials and workmanship entering into the production of a certain type of structure. We learn from this that materials and workmanship form the backbone of the document, while general divisions and notes govern requirements for certain specification work. In discussing the subject it might be well to follow the order in which the specifications are written. First, general conditions; second, materials; third, workmanship.

Speaking of general conditions, I have always liked to define general condition as "obligations" which must be assumed by the owner, architect, and contractor respectively. It has frequently been the case that general conditions were used as a club to brandish over the head of the contractor. Many architects use lengthy general conditions which incorporate much that rightly belongs to the contract agreements, and frequently the conditions of the two documents clash.

The two instruments should be complementary to one another, and should agree in both spirit and letter. We have found that to incorporate a phrase in our contract stating how monthly payments should be made, referring to such and such an article in the general conditions, always take care of the situation no matter what conditions govern. Often paragraphs are written into the specifications in which the architect binds himself to certain obligations he has no right to assume, later neglecting them, and as proceedings ensue he becomes a burden instead of a protection to his client.

Many architects insert in the general conditions paragraphs which safeguard against many errors or omissions on the part of the contractor, so that the contractor loses interest in work. In my opinion this is unjust, and I have known occasions while estimating when both sub-contractors and general contractors have refused to submit figures due to the unfairness and the confusion in the general conditions. Entirely frank and clear general conditions, without any intention of putting it over on the contractor, never fail to bring in a correct bid. In other words, the general conditions should express the obligations of the contractor and state what he is to include in his estimate in addition to materials and workmanship under the various headings and sub-headings.

We have analyzed many things in condensing our general conditions to about four pages. At the outset we state what the owner is obligated to do under these general conditions. He reserves the right to reject any and all bids and to let the work to other contractors, and reserves the right to select contractors, paying a preference. He is to make certain payments and take out and pay for fire and cyclone insurance, and to pay for fuel to heat the building only from the time the plaster is dry.

Among other duties, the architect approves samples and materials, examines shop drawings, and issues promptly certificates of payment.

The Contractor's Obligations

The obligations of the contractors are: He is required to sign a contract to perform the entire work in a satisfactory manner. Where contractors are strangers in the office, we attach our contract form to the specifications, giving them a chance to see the contract they are to sign.

The contractor must select capable sub-contractors only, and shall not settle without the consent of the architect, and shall pay the sub-contractor to the extent of the sub-contractor's interest in the work; he must give the sub-contractor an opportunity to be present and submit evidence in any arbitration; he must be bound to the sub-contractor by all obligations that the owner assumes to the contractor under the general conditions, drawings and specifications; he must be solely responsible for the proper execution of the work and must furnish satisfactory surety bond for a certain per cent. of the work; and when required must keep the building heated until the plastering work is completed; must take out and pay for all forms of insurance except fire and cyclone, which the owner will pay for, and be solely responsible for accident or injury to employees or the public.

He must examine and check drawings and specifications, and if discrepancies are found report to architects. He must not require architects to inspect materials out of the city except at the expense of the contractor. He must keep on the work at all reasonable hours a competent superintendent satisfactory to the architect, with full authority to direct the work, receive instructions and give all necessary information that may be required. The contractor must not consider the issuance of certificates of payment as acceptance of the work.

He must keep the building reasonably clean and collect and remove from the premises all rubbish caused by the trades under his contract. He must see that each branch of the work will be installed by persons whose ability to execute it has been satisfactorily demonstrated to the architect. Then there are also paragraphs calling attention to permits, royalties, licenses, fees, municipal ordinances, state laws, and fire insurance bureaus.

No Conflict in Contract and General Conditions

That will give you an idea of the general conditions that we have built up in our office. We felt that in this way the contractor would be given the information that would obligate him wherever it would be necessary, he could make a charge against the contract for it, and I believe there is nothing I have mentioned which would conflict with the general contract. We have had these general conditions and our contract, as drawn up, turned over to lawyers, and they brought back the information that they could see no conflictions in our contract and general conditions.

Next in order is materials. Of all the items in the specifications, I consider it of prime importance to mention the exact kind and quality of material desired by its trade name. Another difficulty is the placing of materials in their wrong classification so that there is confusion as to the trade name, and it often happens that the same kind of material is placed under several different headings. I recall once that when working as an estimator we had to tear down an entire specification and place the materials in their proper positions in order to make an accurate estimate.

Qualifications of a Specification Writer

Right here I might mention what I think to be some of the qualifications a specification writer should have. He should be well versed in building construction. This requires constant study and a complete and comprehensive catalog file. An architect or designer will have a superficial acquaintance with materials and will use certain materials in design which will not weather well, and it should be the privilege and duty of the specification writer to enlighten him on the subject and suggest proper materials. Such co-operation between designer and specification writer will produce the best results, as I know that designers have very little time to go into the quality of material.

Another important factor is the necessity of keeping in touch with the chief draftsman, gaining through him all of the information required, and seeing that no mistake is made in detailing the work. This supervision will allow the specification writer to investigate the conditions before the final rush to get out the specifications.

The specification writer should keep in touch with new materials and should make it a point to investigate results of those he has used. He should never fail to visit buildings for which he has written specifications. He should fairly constantly keep in touch with the superintendent and consult him frequently about specifications and drawings and seek information about how he might improve his work. He should consult with contractors and sub-contractors, and never refuse to give a few minutes of his time to all material men.

In this connection a good catalog system is of great value. I fear that many of us neglect material men. I appreciate the fact that if we would allow it, they would come into our offices in droves and bother the life out of us. As a rule, I have these men come in to see me at a certain hour, which I have set aside during the day to get acquainted with new materials. The specification writer should know about materials because he writes about the grades and kinds of materials the designer or draftsman places upon the drawing, and as a consequence he must know more about materials than anyone in the office.

Workmanship, as I understand it, means the skill and the knowledge in the placing of certain materials demanded of the workman in order that the work may be executed in a satisfactory manner. In this connection, the specification writer should discuss with the designer the way in which he wants the materials prepared. For instance, the specification writer may say that the job is to be laid in cement mortar perfect to the line, all joints troweled, weather cut, etc. The designer goes out to the job and sees it and then rushes back to say that he had a cut joint in mind and the workmanship has practically destroyed his entire scheme. This does not mean that the designer should be hampered by the specification writer or chief drafstman, because the design should be studied from every angle before being condemned as being impractical.

How does the specification writer gain this information as to workmanship? First of all, he must be familiar with materials. He should have spent a few years drafting, several years as a superintendent, and should have made it his business to visit as many manufacturing plants as possible to acquaint himself with the manufacturing processes. Then he should place his confidence with reliable contractors and subcontractors so that he can obtain first-class information for them. It is an excellent plan to visit buildings of high-grade contractors and architects and compare them with similar work of contractors of less ability. The specification writer learns much of workmanship by observation. I think this covers most of the important aspects of materials and workmanship.

Preparing Specifications from Working Drawings

I want to talk about my method of building specifications from the working drawings. We might at this point consider carefully that the specifications do not serve the architect particularly but that they concern the contractor, estimator, material man, architect's superintendent and manufacturer. Therefore, in writing specifications, these men should constantly be borne in mind. When plans and specifications are ready, the contractor is summoned, given prints and specifications, and is requested to return with his bid at some near future date. If a satisfactory figure is to be obtained, every consideration must be given to the contractor to facilitate his work by describing the work in the most intelligent manner, and fully describing materials in detail as to quality and construction, leaving nothing in doubt. I might mention that I go this far—I refer to catalogs and settle any doubts by referring to an article by its trade name. There have been some questions raised as to this method, but why not refer to an article by its trade name—it saves the estimator a lot of time in looking up catalogs for a thing that fits the general specifications.

I keep in constant touch with the chief draftsman, and when the drawings are approximately 90 per cent. completed, I secure a set of prints and a tablet, on which I make a list of general headings in alphabetical order as they occur, placing the name in the lower right hand corner, and leaving about two or three blank sheets after each alphabetical heading, bearing in mind the trades engaged in the work.

In dealing with materials which enter into the work. I select my material and place a note on the drawings as to which material has been decided upon, making sure that the information is placed on all sections and in plans and elevations to explain the work more thoroughly. I do not allow draftsmen to place notes on the drawings; in fact, it is absolutely forbidden in our office unless they are requested to do so by me. These sheets of notes which I make are to be kept as record sheets, and my idea in doing this is to avoid conflict after collecting materials in their proper headings on these sheets. After collecting these various materials properly, I assemble the sheets in the order I wish to classify the specifications, numbering with red pencil the notes in the order I wish to call attention to them. I then proceed to dictate the first draft of the specifications, requesting the stenographer to leave plenty of margin for corrections and additions. These sheets I treasure.

In the first paragraph of each heading I call attention to the general conditions. Following this are notes such as alternates, allowances, etc., calling the contractor's attention to items specified in other branches of the work, and under these particular notes the question of hoisting materials is decided. We usually specify that the contractor must hoist all materials at the building or furnish hoist and power, and the sub-contractor is to place the material on the hoist and remove it at the proper floor level. The sub-contractor readily sees he has nothing to do with his material but bring it there and deliver it to the hoist.

Scope of Work

The question of work, or scope of work, or work included, is next discussed. The estimator's attention is called to all work specified under this particular heading, placing it in the order as I have numbered the items in red pencil on my notes. The various materials are assembled in order so that when the contractor takes off his quantities he finds his materials all listed in one place and not scattered throughout the specifications.

I next mention workmanship, stating the quality of work we expect in the type of building to be erected, and bearing in mind that a warehouse is not a hotel or a residence and should not require the same quality of workmanship.

Following workmanship, I treat the items under extent of work and describe in detail materials and methods of construction. In carpentry I include the work in general pertaining to carpentry specifications; then from my list of notes explain in detail materials and workmanship in various items. I may discuss the joists and describe them in detail, but I try as much as I can to follow the job through as the work progresses in the building. The estimator likes best to take it off that way.

Under cabinet work, marble work, tile work and similar materials, I specify general items under their proper heading, such as trim, base, architraves, picture moulds, etc. Then when it comes to certain specially designed rooms, I specify that room complete, going on to the next special room for its treatment.

Above all, I avoid the words "or equal" as I find them a bugbear. I never use them in my specifications as I have invariably found there is no "or equal."

During the time I am preparing these preliminary specifications the draftsmen are completing the drawings. When the drawings are practically completed I make sure that all materials are properly noted, selections properly made, and should anything have been added, I make pencil notes on the drawings and have them completed. At the same time I correct the specification draft and turn it over to the stenographer for final writing.

I avoid the practice of sending out letters after plans are issued calling attention to errors, for fear that some contractor may not be reached and will submit his bid without correction. The specification writer should be well versed and accurate and should be responsible for any error in judgment or selection of material.

There is one point I want to emphasize. The architect should realize that the specification writer should really be the man at the head of the drawings. The chief draftsman should control the men and constantly work with the specification writer.

Striking "On The Job"

To strike on the job instead of to strike off the job seems now to be the settled policy of the I. W. W. lumber industry workers, says the National Lumber Manufacturers Association. The word has gone out from Chicago to all I. W. W. lumber workers to hold their jobs as far as possible and at the same time, through passive sabotage, make lumber production so unprofitable as to result in its termination. A recent number of Lumber Workers' Bulletin, an I. W. W. sheet published in Chicago, instructs its followers in these words:

"The employing class lives on our labor. It has to pay us wages, which are a part of what we produce, and everything else we make for it is its profit on which it exists. When we cut down the profits—we starve capitalism. That is the only way it can be hurt. When we strike off the job, we stop the profits, but we stop the expenses too. Now we must all be on the job, drawing wages, but making no profit for the boss.

"It is not necessary to break any laws to do this. Figure out just how little work you can do, and get by. Do that, and no more. Let every I. W. W. member point out to the unorganized that there is plenty of chance to get another job, if one is fired. Let no faller slaughter the virgin forest too recklessly. Let no bucker slash into the logs too hurriedly. Remember that this is dangerous work, and every precaution should be taken to preserve human lives. Go slow. Rigging men, choker setters, loaders, donkey firers, remember that too rapid labor under the hot summer sun induces sun-stroke. Don't do it. Don't get out too many logs. Remember that when you have worked two hours, you have produced enough value to support yourself. Everything you do after that time is the boss's—is a present to your enemy—and the enemy of your class! Take it easy. The boss will use all the profit you give him to oppress you, to build prisons for you, to hire gunmen to shoot you as Fellow Worker McKay was shot in Aberdeen. Don't put these guns into the hands of your enemies. Go slow.

"Everybody on the job—and everybody loaf. Organize all the time. Spread literature, talk to the uneducated, and hinder profits continually. These are our tactics from now on until the next strike off the job."

A Market for Lumber in Short Lengths

Provided Price Adjustments can be Arranged Satisfactorily Retailers Might be Induced to Handle Short Lumber

Supplementing the opinions expressed in our issues of July 4 and July 11, regarding the desirability of marketing short and odd lengths of lumber, the following letters have been submitted to the National Lumber Manufacturers' Association, who have been interested in the subject through the Practical Size Investigating Committee. It will be seen from the two opinions published that the sale of short and odd lengths is regarded as feasible provided some arrangement is made whereby the retailers are compensated for the extra cost of handling such sizes. The following are the opinions in full:

"The use of short lengths is largely a matter of education of the public, that is, the consumer and the contractor, and the retail dealer coming in contact with the consumer and contractor is the one upon whom will fall the burden of education.

"There is in many instances an extra cost of labor in working short lengths and an allowance must be made to the contractor or owner to cover.

"The retail dealer is entitled to compensation for his efforts in educating and persuading the consumer and contractor to use the short lengths. Some inducement in price will have to be made to the contractor or owner over and above the extra cost of labor.

"Nothing would be more detrimental or disastrous to the program of the use of short lengths than for the manufacturer to attempt to cram it down the throat of the public or the retail dealer. As proof of this I call your attention to the effort of the shingle men to force the public to use and the retail dealer to handle the square packed shingles.

"You cannot change in a night a system or a practice that has been in vogue for many years and there are retail dealers and contractors and consumers who will actually refuse to handle or work or buy short lengths in some classes of stock, but there are many retail dealers who will buy all the short lengths that the manufacturers make if proper difference in price is made to compensate them for handling, for extra storage room that is required, for the time and arguments that they have to make induce the consumer and the contractor to use the short lengths.

"It is true there are certain places where short lengths can be handled just as advantageously as longer lengths but until the house or building is planned the retail dealer does not know what lengths can be used and therefore he has to buy and stock in advance without any knowledge of what the demand may be for the different lengths and in many cases there will be a small waste for which an allowance must be made.

One Price is Not Practical

"It is useless to argue with the average retail dealer that one price for all lengths is practical for him or that he can adjust his sale price on longer lengths so that he can sell the shorter lengths at a less price and arrive at an average price that will give him the profit he should have, for he is not experienced in this method of buying and pricing. This is a problem for the manufacturer who can as easily allocate prices of lengths to obtain his average as he can to allocate the prices of the different grades to get his average price for the log.

"The same price for all lengths would put a premium on short lengths and would in many instances be an inducement for the manufacturer to waste material, cutting up pieces that could be used full length in order to obtain a short clear piece that at the price of long lengths would net him more money than the full piece at common prices.

"If the manufacturer will make his difference in the price of lengths to encourage the dealer to handle and the consumer to use, there will be greater demand in a few years that will enable him to readjust his prices.

"The retail dealer does not know until he has stocked it and made the effort how much of this stock he can handle in a year or where it can be used. It will be an experiment with a great many of them and they will not experiment unless they see something in it for them."

Another commentator writes: "The suggestion (in the July 11 issue, page 684) with regard to separating both odd and short lengths from what is usually considered standard and providing for a graduated spread in price, is a very good one, and it seems to me will be the one that will ultimately have to be adopted by the entire industry. This plan would not only be conducive to making the purchase of odd and short lengths attractive to the consumer, but it would also enable the manufacturers to get rid of that part of their product.

"In this connection, our observations seem to indicate that the consensus of opinion among retailers, not only in southern territory, but also everywhere else, is that a spread in price is the most logical way to handle this question; but the manufacturers want to have odd and short lengths included in their lumber grades. The Forest Products Laboratory also is in favor of this latter method.

"The chances are that the average purchaser will want specific lengths and not an assortment of various lengths."

Building Permits Drop During June

According to reports tabulated by the Dominion Bureau of Statistics, there was a decline of 23.6 per cent. in the value of the building permits issued in June as compared with May. This seasonal decrease is often experienced during June, the largest aggregate of permits granted usually occurring in April or May, when the building season is commencing. The comparison with June, 1922, also shows less projected activity during the month under review, there being a reduction of 15.9 per cent. Statements received from 56 cities showed that they had authorized building to the value of $14,345,573, whereas in May, 1923, the total had been $18,766,065 and in June, 1922, $17,052,582.

Are Stone Screenings Suitable for Concrete?

Good Concrete Can be Made With Screenings as Fine Aggregate, Provided Material is Graded so as to be Free of Excess Dust and Extremely Coarse Particles and That too Much Water is Not Used

By DUFF A. ABRAMS*
Lewis Institute, Chicago

There is probably no question in the whole category of concrete testing which raises so many knotty problems as that of the determination of the relative merits of crushed stone screenings and natural sands as fine aggregate for concrete. It brings back to the question of what concrete is and the underlying principle on which the proportioning of mixtures is based and the many details of testing of aggregates and concrete. The methods of testing are very important features of any discussion of the relative merits of different materials in concrete. In other words, if our tests are not carried out in an absolutely comparable manner, we are almost certain to get misleading results and may arrive at entirely erroneous conclusions.

Concrete is a mixture of cement aggregate and water. Too often the water is entirely overlooked in our discussions. We go to great lengths in testing cement and in examining aggregates, but pay no attention to the quality of the mixing water.

Investigations carried out at the Lewis Institute in co-operation with the Portland Cement Association during the past eight or nine years have given us a great deal of new information on the underlying principles of concrete mixtures and on many relative topics. These investigations have shown that the quality of mixing water is by all odds the most important factor in a concrete mixture. Wide variations in the type or size and grading of aggregate and in the quantity of cement, make much less difference on the strength and other properties of the resulting concrete than do slight variations in the quantity of mixing water. This consideration of the effect of quantity of mixing water has a most important bearing on the relative merits of screenings and natural sand; if we do not get the proper balance between the water content in the mixtures, we are certain to get results which reflect that variation rather than the effect of the shape and size of the aggregate article.

Characteristics of Aggregate

The general characteristics of aggregate for concrete are: (1) structural quality (that is, they must have a certain degree of hardness, toughness and general durability, whatever we term it, that will enable them to withstand the stresses which come upon them and to resist exposure to weather, etc.); (2) cleanness—freedom from excessive amounts of clay and dust and from organic impurities such as may occur in surface loam; (3) size and grading, depending on the mixtures used and the type of work under way; (4) shape of the particles.

The only question at issue here is the effect of shape of particles, since we must consider that the aggregates are of similar structural quality and similarly graded, or we are not working on a uniform basis. Natural sands and gravels differ from crushed rocks only in that they have been broken down and in general the particles are rounded by natural agencies. The principal agencies in the production of sand and gravel are, no doubt, glaciation, stream action and weather. Those causes will probably account for formation of sand and gravel, so that we are dealing with the same materials except that one has been rounded and the other has not.

We have studied the relative merits of screenings and sands to some extent, not to as great an extent as we desire, and not to a sufficient extent to clear up all of the problems that arise.

Durability and Cost Must be Considered

In dealing with concrete mixtures, there is always a question as to just what quality of concrete we are trying to secure. All concrete work must be done with a consideration of durability and cost. We cannot get away from those two limitations. If concrete is not durable it will be disappointing in the end; if it costs too much we cannot afford to use it. There are also the important questions of strength, wear, water-tightness, ease of placing, ease of finishing, resistance to various destructive agencies and appearance.

So far as most of these topics are concerned there is little room for choice between screenings and natural sand. However, when we come to such topics as water-tightness, ease of placing and ease of finishing, difficulties are sometimes encountered.

During the past three or four years we have carried out four separate series of investigations in which comparisons were made between the relative merits of natural sands and screenings. These tests apply only to the strength of the resulting mortar or concrete and do not constitute a complete investigation of the subject.

Tests, Series 2

This series includes tension and compression tests of 1:3 mortar at 7 and 28 days, using about 1,300 different samples of fine aggregate from widely scattered sources. These samples were sent to the laboratory for test during the period 1914 to date. For about 800 of the early samples, briquettes of 1:3 mortar by weight were tested at ages of 3, 7 and 28 days; for the remaining 500 samples, 3 by 6 6 in. or 2 by 4 in. mortar cylinders of 1:3 mix by weight or by volume were tested in compression at 7 and 28 days. Among these samples were a large number of stone screenings. Due to the fact that these tests extended over a long period of time, it was our practice to make parallel tests using standard Ottawa sand on each day that other fine aggregates were tested.

It is impracticable to give all the details of these tests in this report; however, the principal conclusions, so far as our present inquiry is concerned, may be summarized as follows:

1. The amount of mixing water used and the manipulation of the mortar may affect the strength more than the grading or type of the aggregate used.

2. For mortars of similar consistency, the strength

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*Before the National Crushed Stone Association.

varied with the grading of the aggregate as measured by fineness modulus (coarser the grading) within certain limits, the higher the strength.

3. Other conditions being equal, aggregates of same fineness modulus gave about the same mortar strength at 7 and 28 days.

4. In general, screenings are graded coarser than the average natural sands; hence, if the grading is not taken into account, the screenings will generally be found to give higher mortar strength than sands.

5. Mortar strength tests do not give definite information on the relative value of sand and screenings for concrete mixtures. There appear to be two reasons for this result: (a) The angularity of the particles in the screenings permits more tamping and consequently probably receives more in the molding of the test pieces, than the sand. (b) In 1:3 mortars the screenings of sand constitute the whole aggregate, while in concrete mixtures these materials are only about 1/3 the aggregate, hence their influence on the final result is much less in concrete than on mortar mixtures. In the case of briquette tests, there is an additional reason for discrepancies in that the shape of the specimen and the resulting distribution of stresses give results entirely different from that found in compression tests of concrete. (This conclusion was reinforced by later series of tests described below.)

Compression Tests, Series 84

Compression tests were made on 6 by 12-in. concrete cylinders at ages of 28 days and 6 months. Mix 1:5 by volume, relative consistency of 1.00 (normal consistency). In this series the fine aggregates were limestone screenings and natural sand and the coarse aggregates crushed limestone and pebbles. Four combinations were used as follows: sand and pebbles, sand and crushed limestone, limestone screenings and pebbles, and limestone screenings and limestone. Twenty-seven different gradings of each of the above combinations were used. The size of the fine aggregates varied from 0 to No. 48 and 0 to No. 4; the coarse aggregate was of the same grading throughout and ranged from No. 4 to 1¼-in.

In order to secure a uniform grading, all aggregates were screened into several sizes and recombined by weight. The sand was largely of limestone origin from Elgin, Ill. As produced for the market, this sand is well-graded up to about ¼-in. and is a high-grade concrete sand, known in the trade as "torpedo." The consistency of the concrete was judged by an experienced operator. A total of 432 concrete cylinders was tested.

Tests show that the concrete made with natural sand and pebbles gave about the same strength as that from sand and crushed limestone. The concrete made with limestone screenings as fine aggregate gave considerably lower strengths. The lowest strengths were obtained with the screenings as fine aggregate and pebbles as coarse aggregate; the strength of concrete was about 2/3 of that from sand as fine aggregate and pebbles or crushed limestone as coarse aggregate. The screenings required about 30 per cent. more water for normal consistency than was necessary with sand; this increase in mixing water would be expected to produce about the reduction in strength indicated.

Tests, Series 145 (A)

This series included tests of mortar and concrete made from about 200 samples of fine aggregates obtained from various parts of the United States and Canada, among which were natural sands, screenings from limestone, granite, trap, slag, chatts and other materials. Tension tests of briquettes of 1:3 mortar (by weight) and compression tests of 2 by 4-in. cylinders of 1:3 mortars (by weight and by volume) were made at ages of 7 and 28 days, 3 months and 1 year. Compression tests of 1:4 concrete in the form of 6 by 12-in. concrete cylinders were made at the same ages; wear tests of 8 by 8 by 5-in. blocks were made at 3 months. The coarse aggregate was pebbles graded from No. 4 sieve of 1½-in. from Elgin, Ill. The relative consistency was 1.10. This investigation included about 3,800 briquettes, 7,600 2 by 4-in. cylinders, 3,200 6 by 12-in. cylinders and 1,200 wear tests—a total of about 15,800 specimens.

Results of Tests

The principal results are given in Tables I and II. In the preparation of the 1:3 mortar, care was

TABLE I—MORTAR STRENGTH TESTS, USING SAND AND SCREENINGS

The relative strength of the mortars is expressed as a ratio to the corresponding strength of standard Ottawa sand mortar of the same mix and same age.

Fine aggregate.	No. of samples.	Fineness modulus.	Water cement ratio.	Flow	—Relative mortar strength— 7 d.	28 d.	3 m.	1 y.
Tension Tests of Standard Briquettes. 1-3 by Weight.								
Sand	87	2.69	0.78	141	1.37	1.18	1.21	1.42
Limestone screenings	11	3.14	0.80	136	1.69	1.50	1.61	1.99
Slag screenings	9	3.45	0.86	122	1.33	1.15	1.33	1.74
Trap screenings	3	3.37	0.77	125	1.89	1.70	1.79	1.99
Granite screenings	4	2.96	0.74	124	1.87	1.53	1.73	2.02
Chatts	10	3.62	0.71	120	2.01	1.74	1.85	2.16
Compressive Tests of 2-in. by 4-in. Cylinders. 1-3 by Weight.								
Sand	87	2.69	0.78	141	1.32	1.23	1.16	1.19
Limestone screenings	11	3.14	0.80	136	1.82	1.59	1.43	1.53
Slag screenings	9	3.45	0.86	122	1.22	1.10	1.08	1.20
Trap screenings	3	3.37	0.77	125	1.71	1.52	1.43	1.53
Granite screenings	4	2.96	0.74	124	1.68	1.56	1.49	1.49
Chatts	10	3.62	0.71	120	1.64	1.56	1.40	1.43
Compressive Tests of 2-in. by 4-in. Cylinders. 1-3 by Volume.								
Sand	87	2.69	0.85	135	1.25	1.16	1.03	1.18
Limestone screenings	11	3.14	0.92	133	1.73	1.41	1.33	1.56
Slag screenings	9	3.45	0.83	122	1.27	1.17	1.07	1.25
Trap screenings	3	3.37	0.86	125	1.48	1.43	1.19	1.41
Granite screenings	4	2.96	0.81	120	1.59	1.48	1.30	1.51
Chatts	10	3,62	0.76	125	1.58	1.48	1.28	1.40

TABLE II—CONCRETE TESTS USING SAND SCREENINGS AS FINE AGGREGATE

Compressive tests of 6 by 12-in. cylinders. Wear tests of 8 by 8 by 5-in. concrete block. Mixed 1:4 by volume. Coarse aggregate in all cases, Elgin, Ill., pebbles graded to 1½ in. Mixed in such proportions that the total aggregate would have an equivalent grading as expressed by a uniform fineness modulus of 5.50. Cylinders cured in a moist room until date of test; tested damp. Wear blocks stored in moist room for 14 days; remainder of curing period in air.

Material	Fine aggregate.			Weight of mixed aggregate Lb. per cu. ft.	Water cement ratio
	Number of samples	Fineness modulus m.	Per cent. for m. 5.50		
Sand	87	2.69	36	126	0.79
Lime screenings	11	3.14	41	122	0.89
Slag screenings	9	3.45	44	115	0.87
Trap screenings	3	3.37	39	123	0.92
Granite screenings	4	2.96	38	124	0.84
Chatts	10	3.59	45	118	0.82

Material	Flow	Compressive strength of concrete, 6 lb. per sq. in.				Depth of wear at 3m. (in.)
		7 d.	28 d.	3 m.	1 y.	
Sand	210	1,710	3,050	4,160	5,330	.54
Lime screenings	198	1,600	2,610	3,570	4,680	.55
Slag screenings	192	1,330	2,430	3,490	4,690	.59
Trap screenings	202	1,380	2,430	3,460	4,550	.55
Granite screenings	198	1,600	2,830	3,970	5,180	.50
Chatts	196	1,600	2,620	4,050	5,290	.52

taken to use the same consistencies throughout. The consistency was judged by an experienced operator and checked by a "flow-table" similar to that used by the Bureau of Standards. Somewhat wetter consistencies were employed in these tests than for standard tests of cement in order to avoid the variation in results due to irregularly graded aggregates when mixed to a relatively dry consistency.

The natural sands and slag screenings had approximately the same average strengths at all ages and gave the lowest values of the materials tested. The stone screenings gave higher average mortar strengths than the sands; the different types of stone screenings gave essentially the same strengths. It should be noted that the average fineness modulus of the sands was smaller than that of the crushed materials, which would be expected to account for the differences in strengths. Attention should be called to the tests in Table II, which shows a different relation for the screenings when the same fine aggregates are used in concrete.

Results of Strength and Wear Tests

Table II. gives the results of strength and wear tests of 1:4 concrete using the same fine aggregates used in Table I., combined in each case with Elgin, Ill., pebbles graded from No. 4 sieve to 1¼-in. Tests were made on 6 by 12-in. cylinders at ages of 7 and 28 days, 3 months and 1 year; also wear tests on 8 by 8 by 5-in. blocks at the age of 3 months. The wear tests were made in a Talbot-Jones rattler by methods described in Bulletin 10, "Wear Tests of Concrete," of the Structural Materials Research Laboratory. The consistency of the concrete was judged by an experienced operator and checked by the flow-table. A high value of flow indicates a more plastic or workable concrete than lower values.

In order to place the different fine aggregates on the same basis in the concrete tests, the relative amounts of fine and coarse aggregate were varied in such a manner as to give a uniform fineness modulus (5.50) for the mixed aggregate; the average percentages of the fine aggregate are shown in the table.

The compressive strengths of the concretes are seen to fall into two different groups: that made of sand, granite screenings and chatts gave nearly the same strength, and that made with limestone, slag and trap screenings gave about 12 per cent. less strength at all ages. The wear at 3 months was also a little greater for the latter materials. It should be noted that a large number of natural sands were used and relatively few samples of screenings. In general more water was used with the limestone, slag and trap screenings for equal consistency than for sand; granite screenings and chatts gave nearly the same strength, the screening water accounts in part for the somewhat lower strength of the concretes made with the limestone, slag and trap screenings.

Tests, Series 145 (B)

In order to determine the effect of mixing screenings with sand, a separate group of tests was made at the same time as Series 145 (A), in which limestone, granite and slag screenings were mixed with various percentages of a well-graded sand from Elgin, Ill. The coarse aggregate for these tests was pebbles graded for No. 4 to 1½-in., also from Elgin, Ill. In this investigation about 500 briquettes, 1,000 2 by 4-in. cylinders, 500 6 by 12-in. concrete cylinders and 100 wear blocks were tested.

In the compression tests of 1:4 concrete, the fine aggregates were combined with pebbles so that the resulting fineness modulus was the same in each case (5.50). The consistency of the concrete was similar, as nearly as could be judged by a skilled operator. A relative consistency of 1.10 was used. In these tests the strength of the concrete increased uniformly with increase in percentage of sand in the fine aggregate. The increase in strength for the concrete made with sand alone over that made with screenings alone was about 12 per cent. at 7 and 28 days and about 20 per cent. at 3 months and 1 year. This result is the reverse of that found in the mortar tests and indicates that the concrete-making properties of the materials cannot be judged on the basis of mortar tests alone. A part of the difference in strength is due to the fact that the required consistency could be obtained with a somewhat smaller quantity of mixing water in the concrete made with sand.

Importance of Control of Mixing Water

The question which is often encountered in using screenings is the workability and ease of finishing, particularly in concrete roads. Dust in screenings in quantities up to, say 10 per cent., does no harm, so long as the concrete is well mixed and of a proper consistency; too much mixing water causes the dust and other fine materials in the concrete to float to the surface where it forms a weak, friable layer called laitance, or produces a concrete which is unable to resist wear and weather. I wish I could emphasize sufficiently the importance of a proper control of mixing water in concrete; there is no feature of concrete making that is more important. Unfortunately, we allow the mixer foreman to use his own judgment in proportioning the water in the batch. It would be just as consistent to measure the water accurately, and guess at the cement, as it is to measure the cement and guess at the water. In general we would get better results by guessing at the cement.

Features of Tests

In closing it may be well to emphasize a few of the most important features of the results of our studies of the strength of mortar and concrete made from sand and screenings.

(1) Aggregate testing has not thus far reached the state of an exact science; in other words available test methods do not always enable us to determine definitely the relative merits of aggregates of different types.

(2) Mortar strength tests are likely to give misleading results, particularly when tension tests are made on briquettes; due to the angularity of particles, the mortar from screenings probably receives more tamping than sand-mortars.

(3) The strength of concrete made from screenings on the same basis is a little lower than the strength of natural sands.

(4) Good concrete can be made with stone screenings as fine aggregate, but it is important that proper inspection be given to see that the material is graded in such a way as to be free from an excess of dust and of extremely coarse particles, and that an excess of mixing water is not used. Due to the angularity of the particles there is a tendency with screenings to use more mixing water than is required by sands; especially where concrete is distributed by chutes.

(5) These tests and other investigations show that good concrete can be found from inferior aggregates, if proper proportions and manipulation are employed; on the other hand very inferior concrete may result with the best of aggregates if improper methods are used. The quantity of mixing water is the most important features of a concrete mix.

(6) Additional studies are desirable in order to bring out the features of the relative merits of sands and screenings.

Slate For Roofing and Structural Purposes

This Commodity Has a Wide Field of Usefulness in the Building Industry—Properties Which Affect Its Serviceability

By OLIVER BOWLES*
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True and easy splitting is one of the important properties of a roofing slate. It is generally recognized that slate splits more freely when it is first quarried before the "quarry water" or "sap" has evaporated. For this reason, water is thrown over a block, or it is protected from evaporation by some other means, until splitting is completed. It is claimed, and has been successfully demonstrated, that seasoned slate may be readily split with a slate splitting machine invented by Vincent F. Lake. It would appear, therefore, that when mechanical splitters are employed, the cleavage of slate may be regarded as a more permanent and more stable property than it is now generally considered. The actual physical effect of seasoning on the cleavability is a field of study that has not yet been adequately covered.

Curvature of cleavage plans is not uncommon in slate deposits and is an undesirable feature. Slight curvature may not condemn slate for manufacture into small squares, but prevents its utilization for blackboards and similar products of large surface area. Advantage has been taken of curved cleavage for roofing round towers, but this use is exceptional.

Resistance to Weathering

Slate consists essential of insoluble and stable minerals that will withstand weathering for hundreds of years. However, small percentages of less resistant minerals may be present. Calcium, magnesium or iron carbonates are slowly soluble in water containing carbon dioxide, and their presence may hasten deterioration. As a rule, a determination of the carbonate present would indicate fairly well the probable resistance of a slate to weathering when exposed on a roof. Some slate in Pennsylvania contains ribbons which consist of narrow original beds usually containing carbon, and darker in color than the main body. There is a tendency for some ribbons to contain an excessive amount of the less resistant minerals and they should not appear on exposed surfaces.

Color and Strength

Slate colors may be fast or changing. The fast colors are due in the main to the presence of iron oxide and other stable oxides. As indicated in the preceding paragraph a change in the color may be due to the oxidation of disseminated carbonates. The terms "fading" and "unfading" are unfortunate. As fading always conveys the implication of inferiority. In some instances the change in color is quite undesirable, in others very pleasing tones of color result. The terms "fast" and "changing" are more appropriate.

Spots and blotches are of common occurrence in the slates of Vermont and New York. Careful chemical and microscopic studies as recorded by Dale indicate that variations in color are due to differences in the proportion of carbonates, pyrite and hematite present. It is probable that decaying organisms embedded in the original shale have reduced the Fe_2O_3 to FeO, and the latter has been removed in solution. Usually in the centres of the spots there is an excess of carbonate which may have originated from the shells of the organisms. In general the spots are permanent features that are practically as stable and unchanging as the colors in the main body of the slate.

The oxidation of carbonate or of the mixed carbonates of iron, lime or magnesia may cause rusty stains. If the carbonates are evenly distributed they may on weathering change the general color of the entire surface. Stains are also caused by the oxidation of iron pyrite. However, the presence of pyrite is not a sure indication that the slate will stain upon exposure, for some forms of pyrite will remain unaltered for many years. The whole question of the oxidation of pyrite in building stones has been fully discussed by the author in another publication.

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*Before the American Society for Testing Materials.

As slate consists of overlapping scales firmly cemented under intense pressure, it is remarkably strong. If slates are not split excessively thin they possess sufficient strength for any roofing demands.

Structural Slate

Slate is widely used for sanitary purposes, and for such uses a low porosity is requisite. An average ot results obtained by the U. S. Bureau of Standards from many slates indicates a porosity as low as 0.38 per cent. Thus, average slate is well adapted in this respect for sanitary uses, and rejection of slate on the basis of high porosity would imply the attempted use of a very inferior grade, such as slate from a weathered ledge.

For certain uses such as steps, lintels, window sills or window and doorcaps, a high transverse strength is required. The peculiar sheet-like structure of slate gives it remarkable strength, a strength far in excess of that possessed by nearly all other building stones. Sandstones are very variable because some are firmly cemented while others tend to be loose and friable. Expressed as the modulus of rupture, the transverse strength of sandstones varies from 350 lbs. per sq. in. for the friable types to 6,500 lbs. per sq. in. for dense quartzites, 1,000 to 1,500 being a fair average. A series of marbles shows an average of 2,410 lbs. per sq. in. across the bed. An average of 72 limestones recently tested by the U. S. Bureau of Standards indicates a modulus of rupture perpendicular to the bed of 1,253 lbs. per sq. in. The modulus of rupture of a series of roofing slates recently tested is 8,216 lbs. per sq. in., about five or six times the strength of average sandstone or limestone and three or four times that of average marble. Thus, slate more than satisfies all reasonable requirements for building purposes.

There has been some hesitancy on the part of architects to use ribboned slate for structural purposes, because the clearly defined borders of the ribbon suggests planes of weakness. Theoretically, there should be no weakness along the line of the ribbon, for it represents an original bed, and the complete recrystallization of the mass has developed structures that are entirely independent of the bedding. To obtain definite information on the question, slabs of ribboned slate were recently tested for transverse strength at the Bureau of Standards, and it was found that when breakage occurred the fractures were never coincident with the ribbons but crossed them at various angles. This proves conclusively that the ribbons do not constitute planes of weakness.

For floor tile or steps resistance to abrasion is an important requisite, In so far as this Bureau is informed, a limited amount of work has been done in determining the actual resistance of slate to abrasion. Where ribboned slate is used in sidewalks, some ot the ribbons, through solubility are worn away as grooves, while others containing an excessive amount of silica stand up as ridges. Such non-uniformity in ribboned slate is an objection to its use, where subjected either to weather conditions or to excessive wear.

SUGGESTIONS ON STANDARDS AND TESTS

Roofing Slate Standards

In free-splitting slate there is a tendency to make slates thin in order to obtain a maximum production from each ton of rock. In consequence, the breakage loss in transit may be high and breakage on the roof may be frequent. This is an unsatisfactory condition for the user, as broken slates are not easily or satisfactorily replaced, and new slates may not match in color with the old roof. This reacts on the producer, for broken slates may prejudice the user against slate in general. It is generally regarded that 3/16 in. should be the minimum thickness allowed, and if this were established as a standard it is highly probable that greater satisfaction would exist among consumers, and that the reputation of slate would thereby be enhanced. The thickness should, of course, be a factor of the transverse strength, but until full information is available on the average strength of slates in various regions it would seem advisable to establish a fixed minimum that covers all slates of reasonable quality.

In fixing minimum thickness, it is not presumed that every slate shall be exactly 3/16 in. thick. Slates are split from natural blocks and are not milled to exact thickness. Slight irregularities may cause the split to run one way or another causing small variations which any specifications should permit. The splitter's chisel with which he measures and determines the thickness should, however, be standardized for 3/16-in. slates.

Standards for Size

Roofing slates are now made in about 29 standard sizes. It might appear at first sight that the number of sizes is too great and that a reduction in the number would be an advantage to both producer and consumer. There is a wide spread movement to reduce production costs by simplifying manufacture, but in the slate industry conditions are entirely different from those that exist in industries where products are molded or built up into finished form. Roofing slates are trimmed to size, and the size is largely governed by the qualities or imperfections of the natural slabs. It may be found that a slate if perfect would trim to 10 by 20-in. size, but on account of some imperfection it may be necessary to trim it to a smaller size. It is noteworthy that if there is a small range of standard sizes, the gaps between them will be relatively large and the waste in trimming down from one size to another will be correspondingly great. A wide range of sizes is, therefore, of definite advantage to the slate manufacturer for it permits him to utilize his raw material to best advantage with a minimum of waste.

A variety of sizes is also an advantage to the roofer. Windy cities require small sizes, also large and massive structures demand larger sizes than are best adapted for small dwellings. Even for the same style of structure quite different sizes are demanded in different cities. Thus in Cincinnati, O., and Galveston, Tex., the principal demand is for 10 by 12-in. slates; in Chicago, 10 by 16-in.; in Columbus ,O., 12 by 24-in. A large variety of sizes permits the manufacturer to cater to the demands of all localities.

It is evident, therefore, that nothing is to be gained by inaugurating any movement toward reducing the number of standard sizes of roofing plates,

Standards for Color Stability

It is unfortunate that some of the trade names applied to slates mask the permanence of their colors. Slate dealers understand the peculiarities of each type, but slate users who are not so well informed are entitled to a set of terms that are descriptive in character and that represent actual qualities. Thus, terms should be employed that clearly distinguish between fast and changing colors.

Standards of Endurance

The endurance of slate may be measured approximately by the percentage of carbonates present, but other factors such as porosity may influence it. Where the ribbon is less enduring than the clear slate, standards should be established on this basis. Slate from the zone of weathering near the surface of a deposit should not be used. While slate has been known to endure exposure on a roof for several hundred years, it is unreasonable to expect that material which has been more or less exposed to the ravages of weathering agencies in its natural bed for several thousand years, may give as satisfactory service on a roof as that obtained from the deep-seated deposits. Architects have lately developed great enthusiasm for variegated highly colored, thick, heavy slates known as architectural grades. The author has observed such slates taken from the zone of weathering where the attractive red, yellow and orange colors were due to excessive oxidation of the iron bearing minerals. Thus endurance was sacrificed for an attractive color. No slate of this character would stand a chemical or microscopic test for endurance qualities, and thus the need is emphasized of establishing definite tests that will protect the user and incidentally the producer.

Standards for Placing Slate on the Roof

A product perfect in quality and faultless in manufacture may fail through improper application. Many instances have occurred where good slate has given unsatisfactory service through improper laying. A 3-in. head lap should be the universal standard. While this is generally recognized, some roofers cut down the lap to 2 in. in order to make a square of slate cover more than 100 sq. ft. of roof.

There is a wide difference of opinion as to the best type of nail to use with roofing slates. The nail should be as permanent as the slate, and standards should be fixed for length, diameter, and point, both for new roofs and for roofing over wooden shingles, composition or other materials.

The strength and spacing of supports, the nature of the sheathing, and the use of paper beneath the slates are all matters that have a definite bearing on the quality of the completed roof.

Structural Slate Standards

Slate for sanitary uses should be graded according to its porosity, and satisfactory service would be promoted by fixing a maximum ratio of absorption.

Strength

There is a dearth of information on the crushing strength of slate, and except for recent tests made at the Bureau of Standards there is a similar lack of data on transverse strength. As already stated the latter figure is exceptionally high. Wider publicity of this feature would benefit the slate producer, and at the same time encourage the builder to use slate with advantage as a substitute for weaker materials. It is not uncommon to see fractured stones in large structures. Where the strain is excessive it is desirable to establish a high standard which only the strongest natural products such as slate can successfully meet.

More definite knowledge of the resistance of slate to abrasion is desirable. Some slate stairways long in use are greatly worn, others resist wear remarkably well. The first step in establishing abrasion standards would involve a long series of abrasion tests upon slate from various localities on the basis of the French coefficient of wear. The qualities should as far as possible be expressed in terms that represent actual wearing conditions in comparison with other standard materials used in steps and floors.

The Week's Developments in a Nutshell

Another Labor strike is over in Canada. The Sydney steel workers have returned without having accomplished the aim for which they struck. It is another indication that the price of labor is at its peak, for the time being at least.

If it were possible for the building and construction industry to attain and hold a steady condition, where all labor is employed but also where the demand is taken care of, it would be a fine thing. We seem to be just about there at the moment. If labor will keep its demands within reason and moderation we believe the industry can maintain its equilibrium for a long time to come. Certain it is that any increase in cost of construction will be met by reduced demand.

In certain sections of Canada there has been a falling of in real estate activity. In Toronto there is said to be around seven thousand houses for sale, most of them new; this has caused professional builders to hesitate to start new houses for fear they may not sell them. A reduction in Toronto building permits in July to $3,039,485.00 compares with $3,760,035.00 a year ago. This is not serious, but it indicates, in the last analysis, that the public have extended themselves to the limit. If building costs more, or threatens to cost more, they won't have it.

Reports from the retail trades indicate an improvement for the first six months of the year, over the same period a year ago. They also report in general that business is still improving, and they are optimistic.

Prices still remain steady. Steel Company of Canada has reduced the price of pig iron 75 cents and the price of coke is down; this should eventually show itself in slight reductions in the finished products, though the steel cut is probably mainly due to over-production at the moment, rather than to reduced cost. In the international steel market it is said that more orders are being booked than a month ago and that increased activity is anticipated during August. •

Calcium Chloride as a Curing Agent and Accelerator*

By H. F. Clemmer and Fred Burggraf
Engineer of Materials, and Assistant Engineer of Materials, Illinois Division of Highways

This paper reviews the investigations in the use of calcium chloride both as a curing agent and as an accelerator in the setting of concrete, conducted by the Illinois Division of Highways, the results of which have led to the adoption of both the external and internal usage of calcium chloride in concrete highway construction.

External Treatment

Over 500 concrete slabs, 8 x 12 x 30 in., were subjected to various treatments and tested for transverse strength. Cylinders, 6 x 12 in., were also made to serve as a check on the compressive strength of the concrete making up the transverse specimens. The same volumetric mix of 1:2:3½, which is the standard adopted by the state of Illinois for concrete highways, was used in all specimens. Portland cement was used in all cases and the aggregates consisted of sand and washed limestone which passed all state specifications.

As Illinois was interested primarily in securing a satisfactory curing at the end of 28 days or earlier, more emphasis was placed on these short-time tests than on 60- or 90-day specimens. For the purpose of checking the strength of the untreated specimens at the older ages, a number of 60- and 90-day specimens were made. At the time of testing, the specimens were removed from their forms and broken in a universal testing machine with the treated side in tension. The modulus of rupture was then computed and the variation in strengths considered as a measure of the completeness of curing.

[Three series are reported, of which the first is typical.]

The accompanying diagram contains a graphical comparison of the results of the various curing methods as indicated by the moduli of rupture of the specimens in Series 1, the results shown being the average of 11 specimens. As the curing of concrete with 2 in. of dirt wet for 14 days has been considered by this state a satisfactory method of curing, the specimens cured under this method have been regarded as 100 per cent cured and the results obtained by other methods taken as a percentage of this.

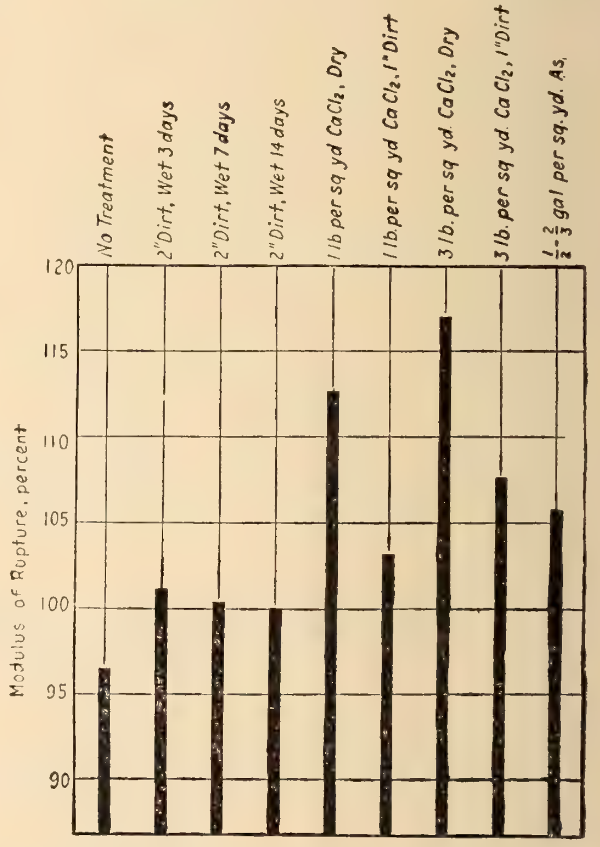
As shown in the figure, only those specimens which received no treatment showed a strength less than 100 per cent, while the specimens cured with 3 lb. per sq. yd. of calcium chloride indicate the maximum of 116.9 per cent curing. Those slabs cured with 1 lb. per sq. yd. of calcium chloride also show a high degree of curing.

The early strength obtained with using calcium chloride curing would indicate that a pavement could be opened for traffic at the end of 14 days, whereas under the old method of curing it was felt unsafe to subject a pavement to traffic in any less time than 30 days. The results obtained from the specimens which were treated with calcium chloride that was removed some hours illustrate that at the end of 28 days, proper curing has taken place. In other words, if the calcium chloride remains on the concrete for a period of 24 hours, its removal will not affect the curing of the concrete. Later tests in this regard illustrate that even less time than 24 hours was required for calcium chloride to properly cure concrete.

A brown surface stain developed on the specimens cured with magnesium calcium chloride. This discoloration of the concrete seems to result from the use of magnesium calcium chloride and for this reason this material as a curing agent is eliminated.

It is evident in the comparison of results on the specimens cured in like manner, but having both a normal and oiled subgrade, that no benefit is derived from the oiled subgrade. In both the 14- and 28-day tests, less strength resulted from the specimens placed on the oiled subgrade than was obtained with the normal condition of subgrade.

A study was also made of the effects of concentrated and excessive amounts of calcium chloride on the surface of mortar briquettes. The proper distribution of this material is a constant source of trouble with the highway department and it was thought advisable to learn as far as possible ~~in~~ the laboratory the effects of too much calcium chloride on the surface of concrete. Consequently, a number of briquettes were made and were subjected to surface applications of calcium chloride up to what would amount to 10 lb. per sq. yd. of surface. A puffing up to the surface was noticed with the result that a deadened concrete was developed. The danger of a like condition developing in a pavement surface is seen when, in cases where moisture is present in the calcium chloride drums, the salt has a tendency to lump into



Comparisons of external treatment of concrete with calcium chloride

Strength of Specimens Cured with 2 in. Dirt, Wet 14 Days, Taken as 100 Per Cent. Cured. Each Result is the Average of 11 Specimens. Age 28 Days pieces of considerable size. When these pieces are larger than the size of an egg, their use should not be allowed until they are broken up, since injurious effects of uneven application of the salt will result.

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*[illegible] presented before the American Society for Testing Materials.

Though the exact action which takes place in the concrete when a surface application of calcium chloride is applied is not known, a theory has been advanced which appears to be the most logical of any yet advanced. The great amount of work done with calcium chloride by the Illinois highway department corroborates so far as is known the theory which is as follows:

The hygroscopic properties of calcium chloride are responsible almost entirely for the value of the material as a curing agent. Though the calcium chloride may not obtain sufficient moisture from the air to satisfy this property, its presence on the surface of a concrete specimen which contains more moisture than the air, attracts moisture to aid in the dissolution. This action of the moisture being drawn to the surface of the specimen leaves minute channels, which, after the complete dissolution of the chemical, affords passages for the calcium chloride solution to penetrate the surface, thus giving it access to more cement particles and causing more complete hydration in a shorter time. This quick hydration and decomposition of the lime compounds of the cement particles on the surface causes an impervious layer which prevents drying of the concrete.

An understanding as to the reason for approximately as great a strength resulting in 14 days from the use of calcium chloride as that resulting in 28 days when curing with wet dirt is apparent when the two methods of curing are considered. In curing with wetted dirt, the increase in strength and hardness of the concrete is due to the ever present moisture which gradually hydrates and decomposes more of the lime compounds. In curing with calcium chloride, the chemical acts as an accelerator in hastening the hydration and inter-reaction of the cement particles on and immediately below the surface.

Rules for Application of Calcium Chloride

As a direct result of the investigation in curing concrete, the Illinois highway department is now permitting the use of calcium chloride in curing state highways. In order to reduce the cost of curing by this method, the amount used has been specified as 2½ lb. per sq. yd. of surface, this amount being considered as effective as the 3 lb. which was employed in the tests. In order to acquaint the engineers and contractors with the use of the material, a circular has been issued which reads:

"Calcium chloride may be used in connection with curing of pavements, taking the place of the usual curing with earth and water, or the curing with water by what is known as the "ponding method." Two and one-half pounds of the flaked or granular material (the flaked is preferred as it is more easily distributed and less easily removed by wind or rain) shall be applied to each square yard of pavement and it shall be distributed uniformly over the surface of the finished pavement by means of a mechanical drilling device or by the use of shovels and long-handled brooms. The material shall not be spread upon the pavement until the latter has thoroughly set—ordinarily from six to eight hours time after the particular pavement has been laid.

"Calcium chloride shall not be applied during rains and experiments have definitely determined that if a rain follows the placing of the calcium chloride after a period of two or three hours there will have been enough absorption of the calcium chloride by the new pavement preceding the rain so that there will not be required additional applications of the material.

"Although the water line for curing of pavements with water may be omitted where central mixing plants are operated and calcium chloride is used in curing; nevertheless the general specifications with regard to wetting of subgrade and the general specifications with regard to placing of burlap on the freshly deposited concrete and the wetting of burlap shall be strictly enforced. The use of calcium chloride for wetting the subgrade will not be permitted. When calcium chloride is used in curing, the sides of the concrete pavement shall be banked with earth as soon as the forms are removed."

Internal Treatments

The investigations in internal treatment with calcium chloride was mainly in reference to the effect on setting time, the strength in low temperatures, the internal temperatures, and the variable strengths obtained with the same percentage of material in different brands of standard cements. Some work was begun on determining the percentage of hydration caused by the calcium chloride but sufficient data are not at hand for a comprehensive discussion of the experiment at this time, although a short outline of the work will be given. Both physical and chemical tests were included in this investigation. A uniform incorporation of calcium chloride was obtained by dissolving the chemical in the gaging water before the water was placed in the mixer.

It was observed that the setting time of the specimens at both temperatures is reduced through the addition of calcium chloride. The specimens containing 3 per cent by weight of calcium chloride indicate the best results as far as securing the quickest set is concerned.

The investigations conducted with concrete specimens poured in low temperatures merely illustrated the fact that even the presence of a large percentage of calcium chloride will not allow the placing of concrete in freezing temperatures without some provision being made to protect the concrete from the cold weather. Probably the most striking feature of this experiment was the failure of the specimens to gain strength past the 14-day period.

Considerable time was spent on the study of the variation of internal temperatures caused by the incorporation of the different amounts of calcium chloride. It was found that a greater heat is generated by the specimens containing the larger percentage of calcium chloride.

It has been fairly well established that various brands of standard cements hydrate four to five times as fast as others when incorporated with a constant solution of calcium chloride.

Building Notes

According to reports, the town engineer of Oshawa, Ont., has issued building permits to the amount of $329,080 for the month of July, which includes $100,000 for the erection of a new school.

For the first two days of this month permits for new buildings of $134,177 aggregate value were issued by the City Architect's Department, Toronto, Ont.

The Contract Record's

Weekly House Suggestion No. 78

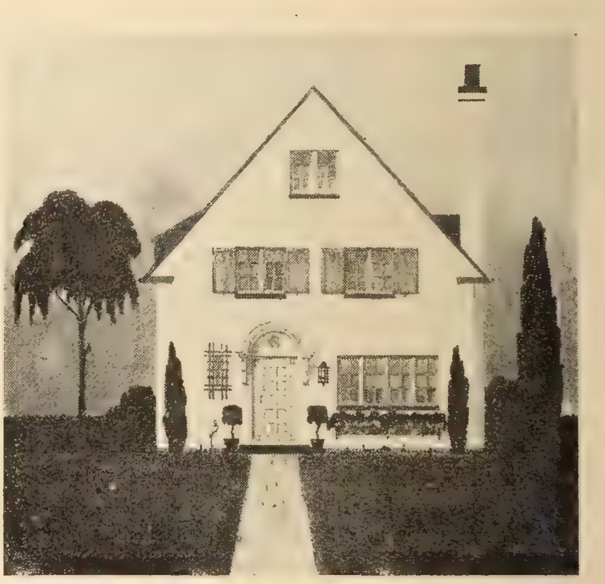
This week's house suggestion is a roomy residence that is in course of construction on Marley Place, London, Ont., for Mr. L. H. Scandrett. The cost will be about $8,500.

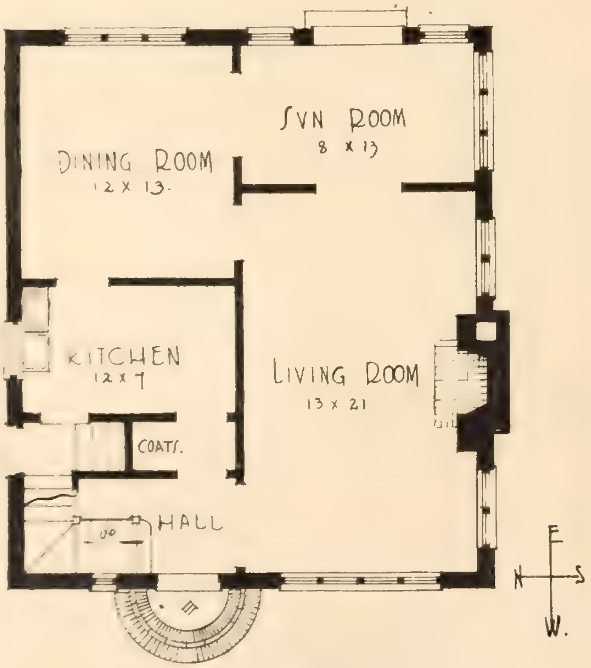
It will be observed from the plans that the rooms are all well proportioned and liberal in size. Thus the living room, which measures 13 feet by 21 feet, is exceptionally commodious, while with the adjoining sunroom, 8 feet x 13 feet, a very roomy space is presented. A small hall with provision for coats gives access to both the living room and kitchen quarters. On the second floor the three bedrooms are ample in size and are well lighted. The exterior appearance of the house, as may be seen from the illustration herewith, is very attractive.

The basement walls are constructed of 12" concrete, while the upper walls are of 8" Natco hollow tile stuccoed on the exterior. The inside is plastered directly on the blocks. The entrance door and hood are enamelled in white, while blue shutters in conjunction with white frames and sash add to the effective appearance. The rooms have the woodwork finished in white enamel with white doors down stairs and birch finished doors upstairs. The stair is enamelled in white with mahogany treads and handrail. The roof is of B.C. shingles, stained brown. Hot air heating is empoyed.

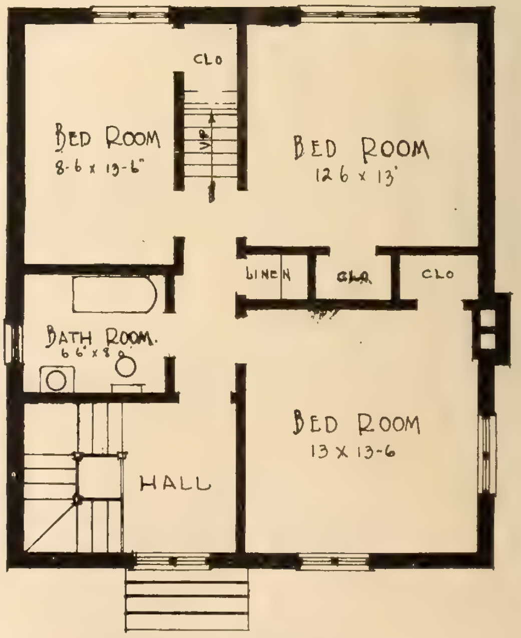
This house stands on a 50 x 200 ft. lot and faces west with a drive on the south side.

The architect was W. Stuart Pavey, London, Ont.





FIRST FL. PLAN.



SECOND FL. PLAN.

Machinery & Equipment

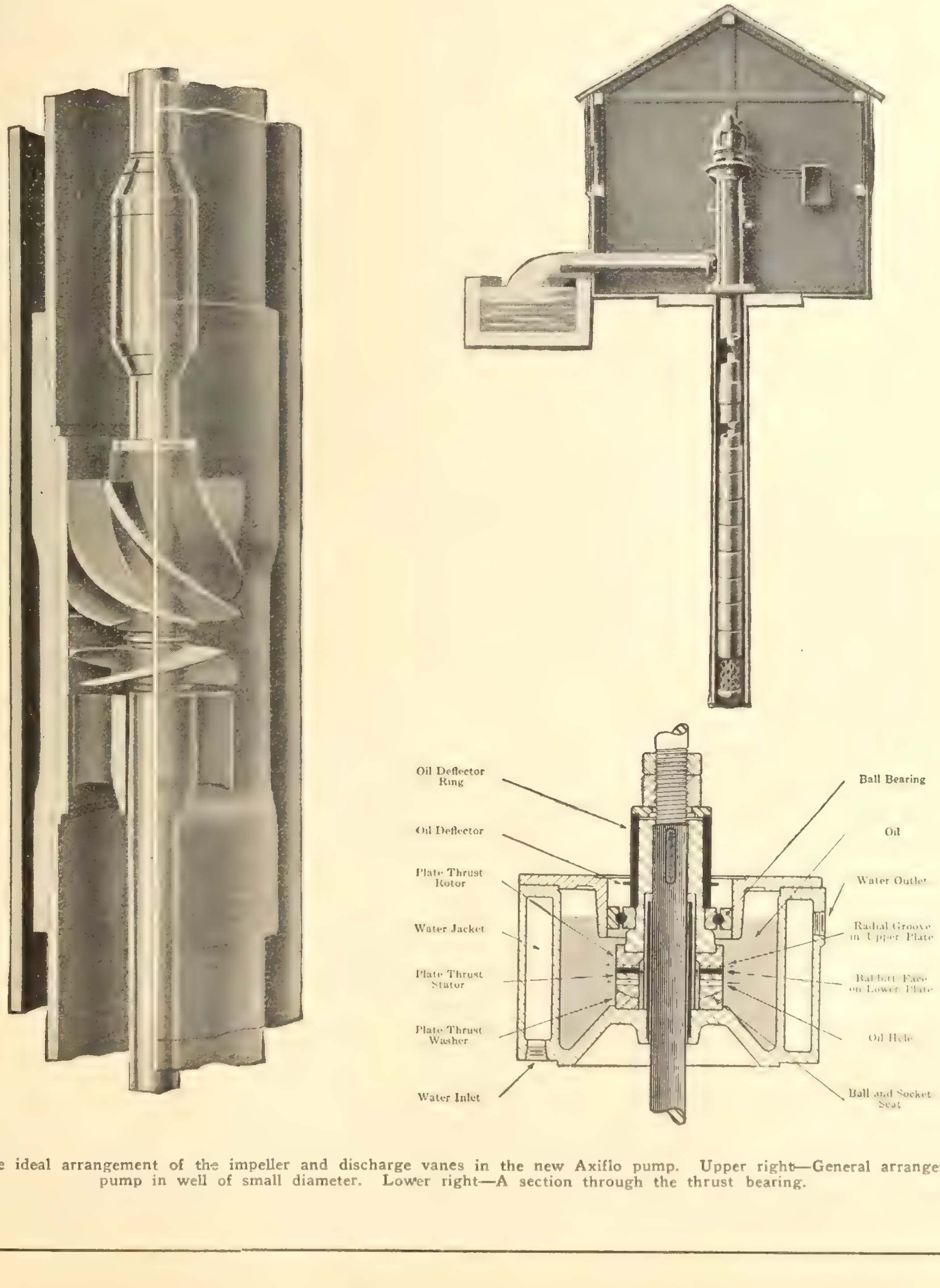
A New Type of Deep Well Pump

A new type of deep well pump has recently been perfected by the Worthington Pump & Machinery Corporation, New York City, operating on a principle heretofore not used in pumps of this kind. Although the pump is of the rotary class the water is not elevated by means of a conventional type of impeller but a form of propeller is used very similar to that employed for propelling ships.

The most radical departure in this pump is shown in Fig. 1. This is a section through a well casing and drop pipe. It illustrates one set of discharge vanes, the impeller, the shaft, the shaft coupling, and the bearing.

Fig. 2 shows the general arrangement of this pump as applied to deep wells with a direct connected standard vertical motor drive on the head. As will be noticed, with this arrangement there is no conversion from horizontal drive to vertical drive. There are no right angled drives at all; everything is in a perfectly straight line.

In comparatively shallow wells, one set of impellers might suffice, but in very deep wells a number of impellers are necessary, these being placed one under the other, thereby making the pump equivalent



Left—Showing the ideal arrangement of the impeller and discharge vanes in the new Axiflo pump. Upper right—General arrangement of Axiflo pump in well of small diameter. Lower right—A section through the thrust bearing.

to a two stage, three stage, or other multi-stage pump.

Where it is desired or necessary to operate this pump by means of a horizontal motor, steam engine, internal combustion engine, or by other means through a horizontal drive, a vertical pulley for belt driving may be placed on the head.

Where water must be elevated to a considerable height above the ground level a centrifugal "booster pump" is added to the Axiflo and connected to the pump shaft at the ground level. This combination gives one compact unit the same as would be ordinarily obtained by using two different pumps, one for deep well pumping and the other for above surface elevating.

The impellers are made of hard bronze, capable of withstanding the corrosive action of the usual well water. The number of and angle of impeller blades, together with their width and thickness vary with the conditions and are based upon calculations and tests which indicate the proper proportions for capacity and efficiency. The discharge vanes, clearly shown above the impeller in Fig. 1, receive water from the impeller and convert the velocity of flow into pressure and at the same time cause the water to flow upwards smoothly along the axis of the pump. These vanes eliminate eddy currents and their accompanying waste. The shaft is of nickle steel and is divided into easily handled lengths, coupled together by long steel couplings insuring good alignment.

The weight of the moving parts and the water column thrust are taken up in a specially designed three-plate self-adjusting type bearing, a cross sectional view of which is shown in Fig. 3. The top or plate thrust rotor is an iron plate which rotates with the shaft. In the centre is a babbitt-faced bearing plate, the upper face of which is scraped to a true bearing surface with the top plate. The bottom plate or thrust washer supports the middle plate on a ball-and-socket seat.

The entire bearing runs submerged in oil and holes through the centre plate allows the lubricant to pass to the cavity inside the plates, where it is picked up by the top plate and distributed through an oil groove arrangement to the bearing surfaces, between the top and middle plate. The oil bath is waterjacketed, a constant circulation of water being supplied by a small impeller attached to the pump shaft. The self aligning feature of this bearing and the fact that it runs submerged in a bath of water-cooled oil, materially reduce the attention required by the thrust bearing. In fact, the only requirement here is the periodic filling of the thrust casing with oil.

The smooth operation of the Axiflo pump, the uniform flow of water and the absence of sudden strains upon the driving parts insure a long life of economical pumping service.

Summing up, the principal advantages claimed for the Axiflo pump are:

1—High efficiency and low operating cost.

2—Compact. Can be used in wells too small for a centrifugal pump. Small floor space.

3—Very simple; only one moving part; little attention required.

4—Long lived because of its simplicity.

5—Continuous flow; free from pulsations.

6—Uniform load on driver. Cannot be overloaded.

7—Quiet operation.

8—Inexpensive foundation.

9—Direct motor drive; or belted drive from engine or motor.

10—Low installation cost on the basis of gallons per minute capacity.

11—Fewer wells. Often saves the cost of a new well by obtaining more water from a given small well that is too small for receiving a larger centrifugal pump.

Mainly Constructional

East and West—From Coast to Coast

The Pacific Berry Growers of British Columbia are making preparations for a considerable extension to their plant. It is their intention to install a small cannery capable of producing two lines, fruit and vegetables.

The Canadian National Railway intend to proceed with their entire Niagara district program of improvements, which includes a new terminal near the Clifton Hotel at Niagara Falls, Ont.

The Fegles Construction Co. Limited, of Fort William, Ont., has been awarded the contract for constructing the new addition to the Tiffin elevator at Midland, Ont. The building is to be completed in time for this year's crop.

Work of construction on the branch of the C.P.R. from Kipawa to Des Quinze Dam in the Haileybury district, is being rushed, and trains will reach the new terminal some time in November.

According to reports from Burnaby, B.C., the building activities there for the first six months of the year, have averaged $10,000 per week, with no sign of a let up at present.

The Dominion Sheet Metal Corporation, Limited has received the order for the galvanized roofing for 750 cars allotted by the Canadian National Railway to the Canadian Car and Foundry Company, Montreal, and the 250 cars allotted to the National Steel Car Company, of Hamilton. The total weight will be about 650 tons.

It is reported that the Stephen Brick Company of St. John, N.B., have practically closed a contract with a New York brokerage firm for the delivery of a million brick for the New York market, with an option of the part of the New York concern for an additional four million.

The erection of a new manufacturing plant at Asbestos, Que., for the Johns-Manville Company is scheduled to start this month. The new plant will require a reinforced concrete building over 1,000 ft. long and slightly over 150 ft. in width. The floor will be of cement six inches thick, while 4,000 feet of glass will be required for the windows and part of the roof.

It is said that the Ontario Jockey Club plan improvements to the Woodbine track, Toronto, Ont., which will involve a new roof for the grand stand and the removal and re-erection of two blocks of stables on another part of the course.

Messrs. Ramsay & McIntosh, of Toronto, have received the contract to install a new system of heating for Bruce County Buildings, the cost of which will be between $9,000 and $10,000.

Tenders have been received by the Port Arthur Lodge, I.O.O.F., for the erection of a hall at the corner of Park and Court Streets.

A meeting of the board of directors of the Canadian National Railway, will be held in Toronto early in August to consider the waterfront viaduct.

A prominent New York builder is planning the erection of 25 houses in Port Arthur, Ont., and intends later on to turn his attention towards Fort William.

The Weston, Ont., Water Power and Light Commission have recently awarded contracts amounting to approximately $27,000 in connection with an extention of the town's water system.

It is reported that the Ottawa Car Company may move their entire plant from Ottawa to Hull, Que., in the near future.

Work of constructing the annex to the Western Terminal Elevator in Fort William, Ont., is being rushed night and day. It is expected that the work will be completed by September when the grain begins arriving at the head of the lakes.

The High Park Methodist Church, Toronto, are prepared to erect a new Sunday School, which with complete equipment will cost $150,000.

Hanover, Ont., will vote on a by-law to spend $60,000 on a new school.

W. G. McGeorge, county engineer of Kent, stated that work will commence in the very near future on a new bridge over the River Thames at Prairie Siding.

Mainville Asbestos Co. will build a large factory near Danville in Richmond Co., Quebec, at a cost of $100,000.

Port Arthur will erect a civic Hockey Arena for which tenders will be called shortly.

Victoria Rotary Club will undertake the construction of a new turberculosis wing to the Jubilee Hospital.

Anyox, B. C., suffered damage by fire to the extent of $100,000. The fire was caused by the explosion of dynamite designed for mining purposes.

Honorable Dr. Sutherland, Minister of Public Works, Victoria, B. C., recently stated that his department will undertake the building of much new roadway this autumn. This will include a fourteen mile road on Queen Charlotte Island.

The Ancient Order of Hibernians, Miss Alice Ratigan, secretary, have been collecting money for the erection of a memorial to the nursing sisters who served in the war. The sum sought is $50,000.

Civic representatives of the city of Hull have been negotiating with United States hotel interests for the erection of a large hotel in that city.

Hull River Co., British Columbia, have a program of construction which includes 26 new homes at a cost of $100,000.

The Department of Railways and Canals, Ottawa, has announced that preparations are being made for the calling of tenders for work on the Port Colborne section of the Welland Canal.

The town of Levis received three tenders for the construction of a filtration plant of $140,000, $154,000 and $186,000.

Commissioner Yorath, of Edmonton, attended a sitting of the Railway Commission at Calgary, to support the application of the city for subways in connection with the C. N. Ry. line.

The province of Quebec has signed the final contracts for roadways which will bring the total expenditure for the year up to near $7,000,000.

The Montreal Exposition Co. has decided to construct a stadium in the grounds of Maissoneuve Park. Details have not yet been arranged.

The Dominion Government has made a further loan of $10,000,000 for the Harbour Works of Montreal.

The London City Council are considering the construction of a dam at Springbank, to form a small lake for recreation purposes.

Port Burwell are planning to erect a $30,000 school.

The Imperial Oil Limited, held a picnic for its employees at Exhibition Park, Toronto, on July 26th. A program of games and contests, followed by a cabaret dance and vaudeville entertainment in the Transportation Building, provided an enjoyable afternoon and evening for the staff.

Piggott & Healey have started work on the foundation of the new Lister Building in Hamilton.

J. H. Marceau, of North Bay, has the contract for building a Roman Catholic church and a school at Kapuskasing.

The Spruce Falls Company are building 40 to 50 houses in Kapuskasing, some of them of a quite expensive type.

Personal

M. H. Braden, contractor, of Port Arthur, has moved to Orillia.

Hon. James A. Robb, Minister of Trade and Commerce, is to visit Toronto and look into the matter of the erection of a terminal elevator here.

Mr. Charles Pfeifer has recently purchased the plant of A. J. Smith at West Lorne, Ont., and will manufacture cement blocks, bricks, verandah posts, flower pots, etc.

Mr. R. J. McClelland, 185 Clergy Street, Kingston, Ont., has gone into the business of manufacturing cement products—blocks, brick, tile &c. Mr. McClelland is well-known; he was city engineer of Kingston for a number of years and his fitness for this class of manufacturing work is unquestioned.

Mr. J. C. Bloomfield, who for a number of years was with R. W. Hunt & Co., Chicago contractor, has now taken charge of the Chicago office of the Industrial Works, at 1051 McCormick Building, handling the sale of "Industrial" equipment in that territory.

Mr. F. C. Palmer, for many years engaged in municipal work in Oshawa and former sanitary inspector of the town has received the appointment of Town Engineer and Street Commissioner of Bowmanville. Mr. Palmer is a member of the Royal Sanitary Institution, London.

Obituary

Sir John Hendrie, president of the Hamilton Bridge Works and former Lieutenant-Governor of Ontario, died recently at the John Hopkins Hospital, at Baltimore where he had been taken to undergo an operation for an intestinal growth. His condition was reported as favorable following the operation, but pneumonia developed and resulted in his death a few days ago.

The death of Mr. Andrew Donald Cross, age 69, recently occurred at his home in Port Colborne, Ont. The early part of Mr. Cross' life was spent on constructional work. Some time before his death he assisted in the organization of the Port Colborne Foundry Co., of which he was president.

The death of Mr. John William Andrews recently took place at St. John, N.B. Deceased, who was 33 years old, was well known as one of St. John's building contractors.

Trade Incorporations

The Orillia Construction & Service Corporation, Limited, was recently incorporated to carry on the work of general construction, electrical installation, plumbing and heating. The president is James Tressider; secretary treasurer, G. Trussler, construction manager, James A Cable.

The Atlas Construction Company has been incorporated to carry on business as engineers and contractors, with headquarters at 84 Dominion Street, Toronto.

Alex. McKay Boiler & Tank Works, Ltd., with head office at Montreal, capital $140,000, to manufacture and deal in boilers and tanks and to carry on the manufacturing of machinery.

Wm. Penk Home Building Company, Ltd., with head office at Longueuil, P. Q., capital $20,000, to erect dwellings.

CONSTRUCTIONAL ACTIVITY

Period of August 1 to August 7, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Drumheller, Alta.

Tenders will be received by H. A. Brown, secretary-treasurer till August 15 for the supply and delivery f.o.b. Drumheller, of the following quantities of materials; 11,000 lineal ft. of 4 in. to 18 in. vitrified tile sewer pipe and junctions; 18 tons of 12 in. cast iron pipe and special castings with flanged lead joints; 500 lineal feet of 14 in. wire wound wood stave pipe; 40 cast iron sewer manhole covers; two 300 I.G.M. centrifugal sewerage pumps with motors and automatic control equipment and installation, automatic feed and discharge apparatus for sewerage disposal works. (Tenders for this apparatus will be received till August 30): Special manhole covers, manhole steps, flap valves, iron screens, ladders and miscellaneous equipment. All labor and sundry material for constructing sewers, manholes, pumping station and sewerage disposal works. Form of tender, specifications, etc., with secretary-treasurer, or Haddin & Miles Ltd., Calgary, Alta.

Golden, B. C.

Tenders were received by the Dept. of Public Works, Victoria, for a highway from Yoho Park to Golden, at a cost of $50,000.

Kirkland Lake, Ont.

The town is installing a new waterworks system, 13,000 feet of wood stave pipe equipped with steel double-couplings and double burlap jacket, having been purchased from the Canadian Pipe Company, Limited, of Vancouver, B. C.

Ladner, B. C.

Tenders will be received by the municipal engineer, no closing date set, for asphaltic paving of Trunk Road West; specifications with the municipal engineer.

Little Bras D'Or, N. S.

Preliminary survey has been made for the dredging for wharf to cost $10,000 and wharf $1,000; assistant chief engineer, Thos. Locke, Halifax, N. S.

Leclercville, Que.

Tenders being received by Deputy Minister, J. L. Boulanger, Parliament Buildings, Quebec, till August 21 for water macadam pavement 1.05 miles long, Levis-St.-Lambert Route; plans and specifications with engineer, A. Paradis, Department of Roads, Quebec.

Niagara Falls, Ont.

Tenders being received by Superintendent, J. H. Jackson, Victoria Park, till August 9 for excavation work and laying of approximately 14,000 lin. ft. of 6 in. and 4 in. cast iron water mains; Niagara Falls to Niagara Glen and Niagara Falls to Dufferin Island; plans and specifications with superintendent.

Tenders being received by Superintendent, John H. Jackson, till August 9, for 9,400 lin. ft. of 6 in. cast iron pipe, 12 hydrants, 12 T's, 8 6 in. stop valves; 8 valve boxes, 4500 lin. feet of 4 in. cast iron pipe, 5 hydrants, 6 T's, 4 4 in. stop valves and 4 valve boxes; plans and specifications with superintendent.

Port Elgin, Ont.

Estimates and plans to be secured at once by the town council on the cost of a sewage system.

Quebec, Que.

Contracts have been awarded by the Prov. Gov't. Dept. Roads, Quebec, for refection of macadamized roads, province of Quebec as follows: St. Stanislaw de Kosto $25,402.40 and Godmanchester Twp. $17,750.36, O'Connors Ltd., 20 St. Nicholas St., Montreal; St. Vincent De Paul $21,023.98 and St. Francois De Salles $12, 183.00 Kennedy Construction Co. Ltd., 310 Shaughnessy Bldg., Montreal; Belle-Plage, Village $6,297.50, Rigaud, Town, $5,021.24 and Ste. Madeleine de Rigaud $23,215.14, Jos. Trudeau & F. Messier Varennes.

Riverside, Ont.

The town council contemplate putting in a storm sewer in Ottawa Street.

St. Emelie, Que.

Tenders have been received by the Department of Public Works for dredging.

Sherbrooke, Que.

The city council has voted $30,000 for paving streets.

St. Raymond, Que.

The town is using in its new waterworks system approximately 26,000 feet of wood stave pipe of the steel coupling type with burlap jacket, supplied by the Canadian Pipe Company Limited, Vancouver, B.C.

Summerland, B.C.

Work has commenced on extension to municipal irrigation scheme to cost $55,000.

South Vancouver, B. C.

Work is to commence soon on the concrete paving of various streets to cost $15,000. This work comprises of laying about 8,641 sq. yds of concrete on portions of Fraser Ave., Victoria Road and 22nd Avenue.

Walkerville, Ont.

Plans are being prepared by the Essex Border Utilities Commission, for an additional water pump.

York County, Ont

The county council have received tenders for the construction of concrete breakwater on south side of Little Range River, near Reesor's Mill, on town line between Scarboro and Markham townships

CONTRACTS AWARDED

Brockville, Ont.

Warren Bituminous Paving Company of Ontario, 54 University Ave., Toronto, has received the contract for pavements to cost $60,000.

Gosfield South Twp., Ont.

The township council has awarded the contract for drainage work to Sanford Bros., Kingsville, general contractors.

Levis, Que.

The city council has awarded the contracts in connection with $130,000 filtration plant to R. T. Smith & Co., general contractors, Montreal, and for the filtration equipment, to Francis Hankin, 598 Union Ave., Montreal.

St. Lambert, Que.

The city council has awarded the contract for paving to Quinlan Robinson & Janin, Ltd., 50 Notre Dame St. Montreal. at $3.09 per sq. yd.; 29,000 sq. yds.

Toronto, Ont.

Contract for asphalt surfacing has been awarded to Kilmer & Barber—De Grassi St., $12,532; Hogarth Avenue $7,265.

Contract has been awarded as follows, for bituminous pavement: Hazelwood, Parkview Gardens and Sixth Street, $3,635, $7,530; $4,214—Commissioner of Works; Springmount Avenue $12,240—Warren Bituminous Paving Co.

The contract for concrete curbs has been let to Commissioner of Works for 5; Constructing & Paving Co. for 2; Kilmer & Barber, for 1.

The following contracts have been awarded for asphalt pavements; Davenport Road $26,580; Ladykirk Ave. $4,748; Seventh St. $3,111,—Kilmer & Barber; Runnymede Rd. $26,682—Godson Contracting Co.; Garfield Ave. and Rose Park Crescent, $23,441—Constructing & Paving Co.; Edward St. $17,798. Heath St. East, $25,439, and Lincoln Road $1,756—Commissioner of Works.

Contract for asphalt pavement to cost $11,601, on Munro St., has been awarded to Kilmer & Barber, 10 Adelaide E., Toronto.

Vernon, B. C.

Work is to start at once on pumping station; W. C. Cryderman, general contractor.

Windsor, Ont.

Chick Contracting Co., is the contractor for pavement to be laid on Marentette Ave. from Ottawa to Tecumseh Road, at a cost of $60,000.

Railroads, Bridges and Wharves

Boischatel, Que.

Tenders being received by Secretary, R. C. Desrochers, Parliament Buildings, Ottawa, till August 22nd for the erection of a wharf; plans and specifications at offices of District Engineers, at Post Office Bldgs., Quebec, Que., Shaughnessy Building, Montreal, and at Post Office Ange Gardien.

Grey County, Ont.
Tenders being received by R. C. McKnight, county engineer, till August 10, for supply and erecting of steel bridge and supplying steel reinforcing for floor; plans and specifications with engineer.

The town council recently called tenders for the erection of a reinforced concrete bridge.

Hardwood Ridge, N. B.
Tenders being received by Gen. Manager L. S. Brown, C. N. Rly. Moncton, till August 10, for the construction of 5 miles of railway spur line; plans and specifications at offices of superintendent, C. N. Rlys. Truro, N. S., Levis, Que., and chief engineer, Moncton.

Nassagaweya Twp., Ont.
Tenders being received by John Marshall, Clerk, till August 11, for concrete bridges—1 12 ft. span bridge; 1-26 ft. culvert; plans and specifications with Clerk and Reeve.

Toronto, Ont.
Tenders being received by C. A. Maguire, chairman, Board of Control, till Sept. 11, for construction on St. Clair Ave. E., over Vale of Avoca of a new steel arch bridge, with concrete piers, abutments, floor and earth fill in approaches, and also for removal of bridge now crossing the same ravine, south of site of new bridge. The complete work will be covered by one general contract. Specifications at Room 313, Works Department, city hall.

Tremblay Twp., Que.
The town council will shortly call tenders for the erection of a metallic bridge to cost $50,000.

CONTRACTS AWARDED

Hardwick Parish, N. B.
Contract for bridge "Gulliver" has been awarded to Whitman Bvewer, North Devon.

Nelson Parish, N. B.
Contract for bridge "Semiwagan" to cost $11,000, has been awarded to Whitman Brewer, North Devon; 60 ft. span, concrete abutments.

Public Buildings, Churches and Schools

Edmonton, Alta.
Tenders have been received for erection of Nurse's Home (Royal Alexandra Hospital) to cost $50,000; 4 stories and basement, 35 x 80 and 25 x 38, brick construction; architect, J. Martland, City Hall.

Hamilton, Ont.
Plans are being prepared for altering residence into Maternity hospital at a cost of $22,000; owners St. Joseph Hospital; architect, Watt & Blackwell, London.

Kitchener, Ont.
Plans are being prepared for the erection of a House of Refuge to cost $100,000; 2 stories, 39 x 50; tenders will be called shortly; architect, W. C. Cowan, King St. East, Kitchener, Ont.

Leaside, Ont.
The erection of the $65,000 school has been postponed for about 3 weeks or 1 month.

Marysville, N. B.
Plans are being prepared for the erection of a school to cost $70,000.

Tenders will be called August 10, by L. R. Fairn, architect, Aylesford, N. S., for the erection of auditorium and lecture rooms to cost $250,000; 3 stories, 184 x 111, brick and stone construction; tenders close August 20.

Mt. Dennis, Ont.
Plans are being prepared, and tenders to be called shortly, for the erection of a church to cost $40,000 on Eglington Ave., near Weston Rd.; owners, Methodist Church; architect, Burden & Gouinlock, Toronto.

Ottawa, Ont.
Tenders being received by Cecil Bethune, Ottawa Collegiate Board, till August 13, for an additional story to the Technical Workshop building; plans and specifications with J. A. Stewart, architect, Jackson Bldg., Ottawa.

Tenders have been received by city council for repairs to pillars in basement of Horwick Hall, Exhibition Grounds.

Tenders being received by Clerk N. H. H. Lett for sub-trades on hospital being erected on Carling & Parkdale Aves., till the following dates: (Service Bldg.) roofing, sheet metal work and mechanical refrigeration—August 9; lathing, plastering, marble and tile—August 16; painting, glazing and ornamental iron—August 23; main building, service building and nurses home—hardware, August 30th; plans and specifications with Stevens & Lee, architects, 62 Charles St. E., Toronto.

Port Arthur, Ont.
Time for receiving tenders for erection of court house, has been extended till August 11. secretary, H. P. McNaughton; plans with C. D. Howe & Co., Port Arthur, and with the Dept. of Public Works.

Port Burwell, Ont.
Plans for the erection of a school to cost $30,000 are being prepared by W. G. Murray, Dominion Savings Building, London.

Port Hope, Ont.
Tenders being received by J. T. Daly, secretary, till August 8, for additions and alterations to Children's Shelter; extending kitchen, 2 extra bedrooms, 2 extra bathrooms, and room for isolated cases.

Point Grey, B. C.
Tenders have been called by the municipality of Point Grey for the erection of a fire hall to cost $30,000.

Regina, Sask.
Tenders have been received for alterations and additions to the heating system and installation of new boilers, etc., in the Public Buildings.

Saanich, B. C.
Plans are being prepared for the erection of a two story office annex to Dominion Observatory which will cost $15,000; tenders will be called shortly.

Selkirk, Man.
Tenders have been received for the supplying and erecting of a water tube boiler in the power house of the Hospital for Mental Diseases.

Scarboro Twp., Ont.
Plans are being revised by the China Missions Corporation, and the lowest tenderers will be asked to submit for an addition to college at Stop 28, Kingston Road.

Viceroy, Sask.
Tenders will be received by James Heale, secretary-treasurer till August 15, for the erection of a brick and tile school; architects, Waterman, Waterbury Manufacturing Co. Ltd., Regina, Sask.; plans and specifications with secretary-treasurer.

Woodstock, Ont.
The following contractors are tendering on addition to Central School; J. D. Tindall & Son, Woodstock. W. J. Taylor, Woodstock; Chas. H. Lampman, Woodstock; Schultz Bros. & Co. Ltd., Brantford; Archibald & Holmes, 709 Yonge St. Toronto; John Hayman & Sons Co. Ltd., London.

Winnipeg, Man.
Tenders were recently received by the city of Winnipeg for structural alterations to central police station.

Weyburn, Sask.
Tenders will be received by the secretary, R. C. Desrochers, till August 10 for alterations and additions to the heating system and installations of new boilers, etc., in the public building; plans and specifications with the Dept. of Public Works, Ottawa.

York Twp., Ont.
Bulk and separate tenders being received till August 14, by Burden & Gouinlock, architects, 101 King St. W., Toronto, Ont., for an addition to Memorial School (Fairbank); 4 rooms, steel tile and brick construction; plans and specifications with architects.

CONTRACTS AWARDED

Anyox, B. C.
The contract for the erection of government offices to cost $12,470, has been awarded to Greer, Beattie & Douglas, Prince Rupert, B. C.; architect, Henry Whittaker, Parliament Buildings, Victoria, B. C.

Beamsville, Ont.
Contract for building high school and vocational building has been awarded to Newman Bros., 75 St. Paul St., St. Catharines.

Bolton, Ont.
Robert Caldwell, Bolton, Ont., is the general contractor for addition and alterations to school at a cost of $14,000; tenders have been received for furnishing and installing a heating and ventilating system for a 6 roomed school.

Blackfoot Indian Reserve, Alta.
Work is to start at once on erection of hospital, 2 stories, 37 x 71, to cost $25,000; general contractor is the Baird Construction Co., Calgary, Alta.

Cooksville, Ont.
Foundations in for $20,000 school on Huron St.; glazing, Excelsior Plate Glass Co. Ltd., Toronto; painting and plastering, general contractor, Edgar S. Warn, Mt. Dennis; heating and plumb-

[illegible] Jenkinson & Lowry, Mt. Dennis; Heating and plumbing, Jenkinson & Lowry, Mt. Dennis; sheet metal & roofing, F. Kidd, Mt. Dennis, steel, McGregor & McIntyre Ltd., Toronto; blackboards, Geo. M. Hendry Co. Ltd., Toronto.

Claremont, Ont.

The School Board has awarded the contract for the erection of a school to cost $35,000, to W. W. Petley & Co., 86 Adelaide St. E., Toronto, general contractors.

Danville, Que.

H. Levasseur, Victoriaville, Que., is the general contractor for addition to Academy Masson to cost $15,000; heating, J. M. Deschenes, Que.

Etobicoke Twp., Ont.

The following contracts have been awarded in connection with the addition to school (Long Branch Camp); structural steel—Disher Steel Construction Co. Ltd.; plastering, Hudson & Moslely; painting, R. Johnson, 17 Galley Ave., Toronto.

Edmonton, Alta.

Contracts for the erection of Garneau School, 3 stories, 146 x 153, 16 classrooms, have been awarded as follows: general contractor, Pheasey & Batson Ltd., Edmonton, $121,049; plumbing and heating, H. Kelly & Co. Ltd., Edmonton, $51,625.

Gull Lake, Sask.

Work has commenced on the erection of fire hall and municipal building which will cost $8,710. Strickland Bros., Shaunavon, Sask., is the general contractor.

Hamilton, Ont.

J. K. Connors, 31 Lamoreux Street is the general contractor for addition to church on King west, and will let subtrades.

The foundations are in for the addition to school to cost $30,000; 179 George St.; mason and general contractor, J. R. Isbister, 125 Wellington St. south; general contractor will let sub trades.

Haileybury, Ont.

The foundations are in for new court house being erected; Dickie Construction Co. Limited, Toronto, is the general contractor; roofing, Douglas Bros., Toronto.

Kitchener, Ont.

Work is to start on new hospital, and the following have been awarded contracts: general contractor, W. M. Sutherland Construction Co., Toronto, $258,000; electric, Knowles Electric Co., London; heating, Grinnell Co. of Canada, Toronto; plumbing, Battler & Frieburger, Kitchener; elevators, Otis-Fensom Elevator Co. Ltd., Hamilton; ice-plant, Canadian Ice Machine Co. Ltd., Toronto.

Montreal, Que.

The following contracts have been awarded in connection with $46,000 Presbytery being erected on St. Maurice St.; plastering, S. Boisvert, 1888 Notre Dame W.; painting, G. Huard, 159 Laval· millwork, F. Tramblay & Cie, 400 William St.

Montreal, Que.

Foundations going in for $10,000 gymnasium being erected rear 697 St. Urbain St.; A. Berk, 27 Bagg Ave., general contractor.

Walls are now going up for addition and repairs to Ste. Clothilde school, at a cost of $28,193; general contractor, Quinlan, Robertson & Janin; millwork, Benoit & Mathieu; roofing, M. Chouinard, electric, Vallee Hamelin; plumbing and heating, T. O'Connell; plastering, T. Bibeau.

Foundations going in for school (Parish St. Pierre Claer); general contractor, J. C. Frennette, 324 Brebouef St.; reinforced steel, Baulne & Leonard, 294 Ste. Catherine St. E.; roofing, plumbing and heating, Belisle & Freres, 225 Chambord.

Megantic, Que.

Contract for the erection of an addition to convent, 3 stories, 40 x 50, to cost $20,000 has been awarded to Armand Grenier, general contractor.

Newcastle, N. B.

D. R. Morrison & Son, general contractors, Summerside, P.E.I., have been awarded the contract for the erection of school on Regent Street to cost $80,000; 2 stories, 65 x 85.

Oshawa, Ont.

The following have contracts on public school being erected on Centre Street; structural and reinforced steel, Lefroy Co., Toronto; tile, Interlocking Tile Co. Ltd., Toronto; electric, Chas. Bowia, Simcoe St. N., plumbing, Miller & Libby, Celina St.; heating and ventilating, Mr. Garrard; plastering, W. J. Trick Co. Ltd., general contractor.

Regina, Sask.

Poole Construction Co., Regina Sask., is the general contractor for addition to college which will cost $53,000.

Sarnia, Ont.

G. Sharks & Sons, Sarnia, are the general contractors for Memorial Sunday School; hot water heating to be sublet; general contractor doing all other work.

St. Baniface, Man.

Walls are going up for school being erected corner Cathedral & St. Jean Baptiste; J. A. Tremblay Co., Winnipeg, general contractors; cut stone, Tyndall Quarry Co. Ltd.; painting and glazing, R. Crawford Painting & Decorating Co. Ltd., Winnipeg; reinforced steel, Gowin & Co. Ltd.; ornamental iron and miscellaneous iron, Manitoba Bridge & Iron Works, Winnipeg.

St. Vital, Man.

Walls are going up for addition to Norberry School. Sutherland Construction Co. Ltd., Winnipeg, general contractors; plumbing and heating, Cotter Bros.; cut stone, Western Stone Co. Ltd.; roofing and sheet metal, Metal Contractors Ltd.; plastering, Jno. Davidson; painting and glazing, Crawford Painting & Decorating Co. Ltd.; reinforced steel, Trussed Concrete Steel Co. of Canada, Ltd.

Toronto, Ont.

The Board of Education has awarded Witchall & Son the contract for grading, $3,956, in connection with addition to Riverdale Technical School.

W. W. Petley & Co., 86 Adelaide E., is the general contractor, all trades, for alterations to theatre at 25 Adelaide W.; owners, Famous Players Canadian Corp. Ltd.

The following contracts have been awarded for addition to Kew Beach School; masonry $4,120—R. Chalkley & Sons; Carpentry $9,394—F. Armstrong; plastering $1,632—E. A. Murby; roofing and sheet metal $1,490—A. Matthews Ltd.; ventilating, heating and plumbing $2,766—Purdy-Mansell Ltd.; electrical work work $145—Patterson Electric Co.

The Board of Education has awarded the following contracts in connection with the addition to Hunnymede School: Masonry $31,789—H. Lucas & Son; steel $8,348—Hepburn & Disher Ltd.; carpentry work $22,900—Hudson & Moseley; roofing $1,797—W. G. Edge Ltd.; plastering $5,695—E. A. Murby; ornamental iron $2,577—Mahaffy Iron Works; plumbing $6,100—Ramsay & McIntosh; heating $7,900—W. F. Clifton; heat regulators $1,745—Canadian Power Regulators Co. Ltd.; ventilating $4,253—W. E. Dillon Co. Ltd.; electric $1,440—Leslie Electric Co.

Thessalon, Ont.

Bridge Bros., Thessalon, have received the contract for plumbing and heating of new school being erected.

Three Rivers, Que.

H. Massicotte & Freres Ltd., Cap de la Madeleine, Que., has received the plumbing contract for $25,000 school being erected.

Windsor, Ont.

Work is to start shortly on separate school being erected on Campbell Avenue, at a cost of $160,000; 2 stories, 85 x 109; G. S. Whelpton, 856 Hall Aveue has received the electrical contract, $2,496.

Foundations are going in for laundry and bedrooms to cost $35,000, for St. Mary's Academy; general contractor Urgel Jacques, 300 Dougall Ave., Windsor.

Winnipeg, Man.

Excavating has started for addition to Nurses Home, Bannatyne Ave. West of Sherbrooke; general contractors, Hazelton & Walin Ltd.; plumbing and heating, Cotter Bros. Ltd.; cut stone, Allen & Grant.

Windsor, Ont.

Jos. L. Heureaux, Wyandotte St. E., has the plumbing and heating contract on separate school being erected on Campbell Ave.

Business Buildings and Industrial Plants

Chicoutimi, Que.

Foundations now in for $15,000 store and residence on Racine St.; Ludger Pearson owner and builder.

Caledonia, Ont.

Work has started on skating and curling rink being built for the Caledonia Arena Co. Ltd.

Estcourt, Que.

Excavating has started for saw mill to cost $8,000; Beaupre & Durette, the owners, are in the market for machinery.

Edmonton, Alta.

Tenders will be received by the owner, Wilson & Horne Ltd., 10301-104th Street, for an addition to warehouse; no closing date set; plans and specifications with owner.

Ford City, Ont.

Tenders to close August 10, are being called on plumbing and heating of by-products building, 2 stories, structural steel and brick construction; for Ford Motor Co. of Canada Ltd.

Guelph, Ont.

Work is to start shortly on alterations to factory of Guelph Soap Co., to cost $15,000.

Hamilton, Ont.

John Goatley, 264 Kensington North, is owner and builder of 4 residences being erected on Marion Ave., Westdale, and will sub-let trades.

Plans are being prepared for the erection of store and apartments on Barton Street, to cost $30,000; owner, S. Garsivits, 338 James St. north.

Moncton, N. B.

Tenders being received by the architect, J. W. Fraser, 132 Steadman St., Moncton, for the building of a masonic temple to cost $15,000; no closing date has been set; plans and specifications with architect

Montreal, Que.

J. J. Joubert Limited, 975 St. Andre St., is the owner and builder of a dairy being erected at 2 Decarie Blvd. to cost $25,000; 3 stories, 62 x 34.

The National City Co. will erect a 10 storey building to cost $600,000 on the site of the Standard Life Insurance Building, 157 St. James St., which was destroyed by fire one year ago.

Niagara Falls, Ont.

Tenders are being received by W. L. Wilkinson, chairman, Niagara Falls Arena Ltd., till August 11 for the erection of an arena to cost $75,000, on Victoria Ave.; 1 storey, 85 x 158; plans and specifications with chairman and Frank Frank Barber & Associates Ltd., 45 Jarvis St., Toronto.

Ottawa, Ont.

Tenders have been received for the erection of a bank to cost $100,000. 1 storey and basement, 60 x 100, stone and brick construction; owner, Bank of Nova Scotia, Toronto; architect, John M. Lyle, Toronto.

St. Catharines, Ont.

The Toronto, Niagara & St. Catharines Railwav are preparing plans for the erection of new freight sheds, corner Geneva St. and Willard Ave.; architect, J. Schofield; tenders will be called this month.

Sault Ste. Marie, Ont.

Dominion Hotels Ltd.; contemplate the erection of a $300,000 hotel, corner Queen and Elgin Sts., which will have 125 rooms.

Three Rivers, Que.

Alp. Laurin, 42 Du Platon St., contemplates the erection of a store to cost $120,000; 3 stories, 300 x 60, brick construction.

Toronto, Ont.

Plans have been drawn for the erection of an office building, about 10 stories, on Spadina Crescent; architect, Neil G. Beggs, 6 Jean St.; tenders will be called in about 6 weeks

The Standard Stock & Mining Exchange, Limited, contemplate the erection of an exchange building to cost $500,000, at 76 King West; probable architect, N. A. Armstrong Co. Limited; 7 stories.

The rebuilding of brick plant, which was recently destroyed by fire, has been started by the Toronto Brick Co., Windermere Ave., Swansea.

Tenders on all trades in connection with a large garage to be erected on north Yonge Street, are being received by the owner, G. M. McKeown, 368 Mt. Pleasant Road; plans and specifications with the owner.

Excavating has started for 2 stores and apartments, 694-6 College St.; owner J. J. H. Jolley, 702 College St.; 2 storey and bas., 32 x 61, brick construction.

Vancouver, B. C.

Work is to commence soon remodelling public market, 25 Hastings St. W., at a cost of $24,000; architect, J. E. Parr, 505 Carter Cotton Bldg., Vancouver.

Vulcan, Alta.

Tenders have been received by the town of Vulcan, for the erection of a skating and curling rink; 1 storey, 125 x 200; architect, Jas. MacDonald, Calgary, Alta.

Vegreville, Alta.

Tenders being received till August 10, by the owner, Wm. Kisryluk, Vegreville, for the erection of stores and theatre at a cost of $15,000; plans and specifications with owner.

Winnipeg, Man.

Work has commenced on addition to factory, Portage & Burnell, for Canada Bread Co ; general contractor, Wyatt-Ireland; cut stone, Allan & Grant, St. Boniface; millwork, Dowse Sash & Door Co. Ltd.; roofing and sheet metal, MacDonald Bros. Sheet Metal & Roofing Co. Ltd., Winnipeg; electric, Schumacher Gray Co. Ltd.; plumbing and heating, C. D. Kirk Co.; plastering, Jno. Davidson, Winnipeg; painting and glazing, Crawford Painting & Decorating Co. Ltd.; reinforced steel, C. A. P. Turner, Winnipeg.

Plans and being prepared for the erection of stores and offices, 5 stores, south side William, between King and Princess Streets; architect, W. Fingland, 313 Fort St., Winnipeg.

Walkerville, Ont.

Tenders have been received by the Provincial Bank of Canada, for the erection of a new bank to cost $45,000; architect, G. J. P. Jacques, 3 Ouellette Ave., Windsor.

CONTRACTS AWARDED

Asbestos, Que.

H. Levasseur, Victoriaville, Que., is the general contractor for the erection of manufacturing plant being erected for the Canadian Johns-Manville Co. Ltd.

Cranbrook, B. C.

Jones & Doris, Cranbrook, B. C. are the general contractors for the erection of store and offices to cost $10,000 on Baker Street; 2 stories, 50 x 80.

Calgary, Alta.

Work is to start at once on the erection of flour mills to cost $30,000 for the Western Canada Flour Mills Co.; 1 storey, 25 x 80; general contractor, Carter, Halls, Aldinger Co., Edmonton, Alta.

Ford, Ont.

Mr. L. R. Parent, Ford City, Ont., is the owner of store and residence being erected on Ottawa street to cost $1,300; 2 stories, 48 x 43; F. C. Parent, Riverside, Ont., is the general contractor.

Wells & Gray Ltd., Ford, Ont., are the general contractors for erection of heat treat building; owner, Ford Motor Car Co.; of Canada Ltd.; architect, Albert Khan Ltd.

The Jno. V. Gray Construction Co., Windsor, is the general contractor for the erection of a coal bunker.

Hamilton, Ont.

J. Dunlop, 53 Britannia Ave., has the heating contract on apartments being erected on Cameron St. East.

Mill Bros., Imperial Building, Hamilton, is the owner and general contractor for store and apartments to cost $15,000 being erected on King St. E., near Walnut; excavation, J. D. Armstrong; tenders being received by owner on sub-trades.

Kitchener, Ont.

Henry Neeb, South Ontario Street, has the contract for plumbing and heating of stores and residence being erected corner Weber and Victoria Streets.

Walls are now going up for the annex to hotel "Windsor"; contract for plumbing has been let to G. Grosz, King St., Waterloo; Battler & Freiberger, King W., Kitchener, has the contract for heating.

Montreal, Que.

Vincent & Say Elec. Co. Ltd., has the contract for electrical work in connection with $25,000 molasses distillery being erected at 1706 Notre Dame E.; Bannell Bros., are the general contractors.

The Phoenix Bridge & Iron Works has received the contract for the beams for stores and factory at 443 St. James St. W.

North Battleford, Sask.

Work is to commence soon on the erection of a beef packing plant to cost $350,000, for the Saskatchewan Breeders & Packers, Ltd.; general contractor —Gardiner Construction Co. Ltd., Welland, Ont.

Oshawa, Ont.

W. J. Trick & Co., Oshawa, Ont., is the general contractor for the service building being erected for General Motors of Canada Ltd., and will do the carpenter and millwork.

Outremont, Que.

Brickwork has started on three flats being erected on Durocher, near Van Horne; general contractor, A. Pilon; brickwork, C. Frenette.

Pembroke, Ont.

M. Slattery & Son, general contractors, Arnprior, Ont., have been awarded

(Continued from page 55)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tender for Concrete Piers and Abutments

County of Kent

Sealed tenders will be received by the undersigned until noon on

Friday, August 10th, 1923,

for the construction of Two Concrete Abutments and two concrete piers for the proposed bridge over the River Thames near Prairie Siding Station on the Canadian National Railway.

The work involves the placing of about 1150 cubic yards of concrete and the driving of about 250 piles, in addition to sheet piling and other work.

Plans and specifications and forms of Tender and contract may be seen at the office of the undersigned, Chatham, Ontario.

Tenders must be accompanied by marked cheques for at least 5% of the amounts of the Tenders.

The lowest or any Tender not necessarily accepted.

W. G. McGEORGE, C.E.
30-31-32 Chatham, Ontario.

TENDERS FOR

80 MILLION GALLON CENTRIFUGAL PUMP.
25 MILLION GALLON PUMPING ENGINE.
GENERATOR.
SUPPLY OF CAST IRON PIPES.
STOP VALVES.
SPECIAL CASTINGS.

Tenders will be received by registered post only, addressed to the Chairman, Board of Control, City Hall, Toronto, up to 12 o'clock noon,

Tuesday, October 9th, 1923,

for the following:

Tender No. 44—One only 80 million imperial gallon low lift centrifugal pump.
Tender No. 45—One only 25 million imperial gallon pumping engine.
Tender No. 46—One alternating current generator.
Tender No. 47—16-inch cast iron pipes.
Tender No. 48—36-inch cast iron pipes (a).
Tender No. 49—36-inch cast iron pipes (b).
Tender No. 50—10-inch and 36-inch stop valves.
Tender No. 51—16-inch and 36-inch cast iron special castings.
Tender No. 52—72 and 60-inch and 48-inch valves.

Envelopes containing tenders must be plainly marked on the outside as to contents. Specifications and form of tender may be obtained at the Works Department, Room 12, City Hall, Toronto. Tenders must comply strictly with conditions of City By-law as to deposits and sureties, as set out in specifications and form of tender.

The lowest or any tender not necessarily accepted.

C. ALFRED MAGUIRE, (Mayor),
32 Chairman, Board of Control.

For Sale

Half million hard wire cut face or backing brick, for immediate delivery. Box 323, Contract Record, Toronto. 30-31-32

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

TOWNSHIP OF MINTO

Tenders for Municipal Drains

Sealed tenders will be received by the undersigned up to noon of

Saturday, August 18th, 1923,

for the construction of Municipal Drain No. 16 in the Township of Minto, consisting of 1882 cub. yds. of excavation in open ditch and 7600 lineal feet of tile drains.

Plan, profile and specifications may be seen at the office of the undersigned, Harriston, Ont.

An accepted cheque for 5% of the amount of the contract will be required to accompany each tender and the successful tenderer will be required to furnish a Guaranty Bond for 50% of the amount of the contract. The Township of Minto will pay the premium.

The lowest or any tender not necessarily accepted.

W. D. McLELLAN,
Clerk of the Township of Minto,
32-33 Harriston, Ont.

Queen Victoria Niagara Falls Park

TENDERS

Sealed tenders plainly marked as to contents, will be received, by the undersigned, up to 12 o'clock noon, on

Thursday, August 9th, 1923,

for the supplying of the following materials:-

9,400—lineal feet of 6" cast iron pipe.
12—Hydrants.
12—T's.
8—6" Stop Valves.
8—Valve Boxes.
4,500—lineal feet of 4" cast iron pipe.
5—Hydrants.
6—T's.
4—4" Stop Valves.
4—Valve Boxes.

Information pertaining to materials and forms of tenders may be obtained on application.

A marked cheque for five per cent. of the contract price must accompany each tender.

The lowest or any tender not necessarily accepted.

JOHN H. JACKSON, Superintendent,
Queen Victoria Park,
31-32 Niagara Falls, Ontario

Queen Victoria Niagara Falls Park

TENDERS

Sealed tenders plainly marked as to contents will be received by the undersigned up to 12 o'clock noon, on

Thursday, August 9th, 1923,

for the excavation work, and laying of approximately 14,000 lineal feet of 6" and 4" cast iron water mains.

Plans and specifications may be seen, and forms of tenders obtained upon application.

A marked cheque for five per cent. of the contract price must accompany each tender.

The lowest or any tender not necessarily accepted.

JOHN H. JACKSON, Superintendent,
Queen Victoria Park,
31-32 Niagara Falls, Ont.

TENDERS

For the Construction of a Bridge on St. Clair Avenue East, over the Vale of Avoca

Tenders will be received through Registered Post only, addressed to the Chairman, Board of Control, City Hall, Toronto, up to noon

Tuesday, Sept. 11th, 1923,

for the construction on St. Clair Avenue East, over the Vale of Avoca, of a new steel arch bridge, with concrete piers, abutments, floor and earth fill in approaches; and also for the removal of the bridge now crossing the same ravine, south of the site of the new bridge. The complete work will be covered by one general contract.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained upon application to Room 313, Department of Works, City Hall, on payment of twenty-five dollars ($25.00), this sum to be refunded on return of plans.

Tenderers must comply strictly with conditions of City By-law as to deposits and sureties as set out in specifications and form of tender.

The lowest or any tender not necessarily accepted.

C. ALFRED MAGUIRE, (Mayor),
32-33 Chairman, Board of Control.

For Rent or Sale

One Keystone Excavator in A1 condition. Apply Box 350, Contract Record, Toronto. 32

For Sale

1 Sawyer Massey Road Grader.
1—50 ton bin and screen, with elevator and buckets.
1—London paver.
Box 291, Contract Record, Toronto. 30 t.f.

Tenders Wanted

Tenders will be received up until 6 P.M.

Monday, August 20th, 1923,

for the General and Mechanical trades required in the erection and completion of a High School Building for Timmins, Ontario.

Plans may be seen at the Secretary's office Timmins, Ontario, Contract Record, Toronto and from the Architects. Bids must be accompanied by a certified cheque or Bid Bond for 5% of estimated cost and sent to Mr. H. E. Montgomery, Secretary of High School Board, Timmins, Ontario.

The lowest or any tender not necessarily accepted.

J. C. PENNINGTON, JOHN R. BOYDE,
Architects and Engineers,
J. W. LEIGHTON, Associate,
Bartlet Building,
32 Windsor, Ontario.

County of York

Sealed tenders, plainly marked as to contents will be received by the undersigned up to 12 o'clock noon of

Thursday, August 16th, 1923,

for the construction of a reinforced concrete bridge on the townline between Markham and Pickering Townships, about one-half mile east of Mongolia.

Plans and specifications may be seen at the office of the Engineers.

The lowest or any tender will not necessarily be accepted.

FRANK BARBER AND ASSOCIATES, Limited,
Engineers, County of York,
45 Jarvis Street,
TORONTO.
Toronto, August 4th, 1923. 32

To Steam Fitters and Plumbers

Sealed tenders marked "Plumbing etc.," addressed to the undersigned, will be received at this Department until

Saturday, August 18th, 1923,

for steam heating of the Administration Building, Ontario Hospital, Whitby, steam heating and plumbing of the War Memorial Hall, Guelph, and steam heating and plumbing of the Court House, Haileybury.

Plans and specifications for all works may be seen at this Department, for the Memorial Hall also at the office of the Bursar of the Ontario Agricultural College, Guelph, and for the Court House, Haileybury, at the office of the Clerk of Public Works at Haileybury.

Each tender must be accompanied by an accepted bank cheque payable to the Hon. George S. Henry, Minister of Public Works and Highways, Ontario, for five per cent. of the tender and the bona fide signatures and addresses of two sureties, or the name of a Guarantee Company approved by the Department, willing to provide a bond for the due fulfilment of the contract.

The Department is not bound to accept the lowest or any tender.

By order,
H. F. McNAUGHTEN,
Secretary, Public Works Department, Ontario.
Toronto, August 4th, 1923.

Newspapers publishing this without authority will not be paid for it. 32

Tenders for Steel Bridge

Sealed tenders will be received by the undersigned up to and including

Friday, August 10th, 1923,

for supplying and erecting a steel bridge according to Plate 2, General Plans for Steel Highway Bridges, Ontario, 1917, 40 feet clear span 16 feet roadway Class "A" loading; and for supplying the steel reinforcement for the floor of the above bridge.

Plans and Specifications may be seen at the office of the Engineer in Owen Sound.

Tenders must be accompanied by marked cheque for five per cent of amount of tender—cheques being made payable to the Treasurer of the County of Grey.

The lowest or any tender not necessarily accepted.

R. C. McKNIGHT,
31-32 County Engineer.

City of St. Catharines

Tenders for Cement Concrete Pavements

Sealed tenders will be received addressed to the Chairman of the Board of Works, City Hall, St. Catharines, Ont. up to 5 o'clock P.M. of

Thursday, August 16th, 1923,

for the construction of 3500 sq. yds. of cement concrete pavements.

Plans and specifications may be seen at and form of tender obtained from the office of the City Engineer. Envelopes containing tenders must be plainly marked as to contents.

All tenders must be accompanied by a marked cheque for five per cent. of the amount of the tender.

The lowest or any tender not necessarily accepted.

B. F. LAMSON,
32 City Engineer.

Some One Wants to Buy

The equipment or machinery that you are not using.

It may be occupying valuable space in your yard or shop, collecting dust, rust and hard knocks.

Sell it before "Depreciation" scraps it.

Use the **Tender & Proposals Department.** It helps others, let it help you.

For Sale—Crane

Full Revolving, wide gauge Travelling Crane fifty foot steel lattice boom and one yard grab bucket. Box No. 344, Contract Record, Toronto 31

STEEL PILING

Bought and Sold

Universal Equipment Company

28-t.f. Niagara Falls

For Sale

One Cleveland Tractor rebuilt and in good working order. Price $375.00. J. C. Russell, 109 Youville Square, Montreal. 32

For Sale—Cheap

1—6 ft. Wettlaufer Mixer on trucks with side loader and gasoline engine. Overhauled and painted and in good running condition. K. W. Lewis, 105 Front St. East, Toronto, Ont. 28 T.f.

SALES ENGINEER opening office in Montreal will represent responsible manufacturer on commission basis. Box 341, Contract Record, Toronto. 31-32

Construction Superintendent—experienced, successful handling bridges, difficult foundations, various buildings and other works, open for position with general contractors. Box 352, Contract Record, Toronto. 32

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Sydney Harbor Bridge

The date set for the receipt of tenders for the construction of the Sydney harbor bridge at Sydney, New South Wales, has been extended to November 20, 1923. Copies of tender form and the revised specifications (1923), which provide for an arch-type bridge, as well as the cantilever type, as originally specified, have Foreign and Domestic Commerce and will be made available to interested Americans and Canadian firms upon been received in the U. S. Bureau of request to the Iron and Steel Division.

Mexican Railway Extension

It has been reported that the Southern Pacific Company of Mexico has arranged to construct 102 miles of track south of Tepic to Quemada, to connect with the railroad at San Pedro de Macoris, Guadalajara. Heavy engineering work, including the construction of 30 tunnels, will be involved; and the cost of the undertaking is estimated at $12,000,000. (a) furnaces and oil burning equipment complete, (b) de-aerating open heater complete, (c) three integral type super heaters complete, (d) for the supply of all labor and materials necessary for the erection of two self-supporting steel stacks on the site of the city's steam stand-by plant. Specifications may be obtained from the office of the City of Winnipeg Hydro-electric System, 55 Princess St.

Business Buildings and Industrial Plants

(Continued on page 58)

the contract for the erection of freight shed to cost $45,000, for the Canadian Pacific Railway.

Prince George, B. C.

Work is to start at once on the alterations to hotel, to cost $19,650; 3 stories, brick veneer construction; architect, Henry Whittaker, Victoria, B. C.; general contractor, McInnis & Wilson, Prince George.

Sortin, Que.

The foundations are in for a $10,000 bunk house being erected for the Canadian Pacific Railway; general contractor, W. H. Madegan, 949 Atwater Ave., Montreal; electrical work, J. Trofford, 163 Decarie Blvd.; plumbing and heating, T. J. Byron, 1665 Delorimier Ave.

Three Rivers, Que.

Work is to start at once on the erection of a bank to cost $15,000 for the Canadian Bank of Commerce; Heon & Fils, St. Antoine St., Three Rivers, is the general contractor.

Toronto, Ont.

The following contracts have been let for addition to lunch room, 3 stories and basement, 30 x 100, 11-13 King E., to cost $150,000; general contractor, W. T Joy; steel, Reid & Brown Structural Steel & Iron Works Ltd.; excavating and wrecking, W. H. Thompson; terra cotta, Federal Terra Cotta Co., agent, John Lindsay, 250 Richmond W., Toronto; prob. plumbing and heating, T. B. Smyth, 182 Avenue Road.

W. J. McGuire Ltd., has received the heating and plumbing contract in connection with the office building and automatic exchange being erected at north east corner Shepard and Temperance Streets.

Vernon, B. C.

Work is to start at once on drug store being erected on Barnard Avenue; at a cost of $15,000; contractor, John Moffatt; heating, Vernon Hardware Co.; electric, Northern Electric Co.

Toronto Wrecking Co., have received the contract for wrecking of manufacturing building north east corner Spadina Ave. and Phoebe St., owned by the Empire Clothing Co. L. E. Dowling, Toronto, general contract.

The following have contracts on office building and automatic exchange, north east corner Shepard & Temperance Sts.: metal windows and doors, A. Matthews Ltd.; roofing, Duthie & Sons Ltd.; stairs and ornamental iron work, Canadian Ornamental Iron Co. Ltd.; plastering, W. J. Hynes Ltd.; carpenter work, Wm. Munro & Son; painting and glazing, W. J. Bolus Co. Ltd.

J. McCausland & Son Ltd., Toronto, has the painting contract, addition to departmental store, south side Queen W., near Yonge; Jackson-Lewis Co. Ltd., is the general contractor.

Jas. Casey, 30 Dalhousie St., has received the contract for the painting in connection with warehouse being erected on Front West; owner, Cassidy's Limited, 51 St. Paul W., Montreal, Que.; E. G. M. Cape & Co., Montreal, is the general contractor.

Vancouver, B. C.

Work is to start at once on new warehouse being erected north east corner Woodland Drive and Powell Streets, to cost $30,000; 1 storey, 134 x 203; Joseph W. Bye, 958 Broughton St., Vancouver, is the general contractor.

Residences

Mr. N. D. McKinnon, Cannington, Ont., is the owner of a residence being erected at a cost of $18,000; tenders are being reecived by the architect, J. Hunt Stanford & Son, 67 Yonge St. Arcade, Toronto, for labor only on Random Ashlar superstructure, 2 stories, 42 x 34, stone contsruction.

Chicoutimi, Que.

Tenders are being received by the owner, Pitre Desbiens, till August 10, for the erection of a residence on Riverin Avenue to cost $10,000; 3 stories, 40 x 30, concrete foundation, brick construction, tar roofing, electric lighting, hot water heating, hardwood floors.

London, Ont.

Plans being prepared for 5 residences to cost $30,000, on Ridout St. S.; owner, A. Dickinson, 29 Ardaven Place; prices wanted on all materials; owner, will build one house at a time, red or ordinary brick construction.

Montreal, Que.

A. Leclair, 188 4th Ave., Mais., is the owner and builder of 3 residences on Leclair Ave., Mais., being erected at a cost of $20,000.

Montreal, Que.

Work is to start shortly on 5 residences on Marquette St., at a cost of $40,000; owner and builder, J. H. Demers, 566 Marquette St.; prices wanted on all materials.

Toronto, Ont.

A. R. Kingsmill, 282 St. George St., is owner of residence being erected on St. Leonards Ave., to cost $12,000; 2 stories, brick construction; tenders being received on electric, plumbing, painting, heating and plastering.

Toronto, Ont.

Foundations going in for 5 bungalows w. s. Ossington Ave., near Geary Ave., to cost $20,000; owner and builder, A. Jewer & R. Prince, 509 Concord Ave; 2 stories 20x32, brick construction.

Toronto, Ont.

Hillcrest Land Co. Ltd., 71 Moore Ave., is owner of 6 residences being erected on Heath St. E. to cost $45,000; 2 stories, brick construction.

Toronto, Ont.

Geo. W. Hunt, 35 St. Leonard Ave., is owner and builder of 6 residences being erected on Balliol St.; 2 stories, 21x 34, brick construction; electric, plumbing, painting, heating and plastering trades to be let.

Toronto, Ont.

Excavating has started for two detached residences being erected on west side Glenrose Ave., to cost $16,000; 2 stores and basement, 24 x 43, owner, C. Urquhart, 547 Euclid Ave.: architect, J. Hunt Stafford & Son, 67 Yonge Arcade, Toronto.

CONTRACTS AWARDED

Hamilton, Ont.

R. S. Mason, 41 Hilda, is owner of residence being erected on Main E. between Hilda & Glendale, to cost $10,000; 2 story, brick construction; plumbing and heating, H. Barnes, Delta Block; plastering, Hill Bros., Hamilton.

Work has started on 12 residences, to cost $48,000, on Ashford Blvd; owner and general contractor, W. Atkinson, 29 Cedar Ave., who will let sub trades; plumbing, Jas. Saynor, 427 Aberdeen Ave.

Kitchener, Ont.

W. Heberbrandt, Cherry & Park Sts., is owner of $10,000 residence being erected on Park St., and will receive tenders till August 18 for electric, heating, plumbing and painting trades; S. F. Dippel, carpentry work.

Montreal, Que.

The following contracts have been awarded in connection with 2 residences being erected on Valois, between Ontario and Rouen, at a cost of $16,000; brickwork, D. Savard, 713 Letournex; roofing, C. Desjardins; plumbing and heating, J. Sylvester.

Z. Cusson, 1256 St. Lawrence Blvd., has received the roofing, plumbing and heating contract for $9,000 residence being erected on Park Ave. between Van Horne and Bernard; owner and builder B. O. Adam, 51 C. Colomb St.

The following contracts have been let in connection with residence being erected on Berri, between Faillon and Villeray; masonry, T. Verville; roofing and plumbing, H. Corbeil. electric, E. Pilon; plastering, N. Lapierre.

The walls are going up for residence being erected on St. Catherine Road; owner, J. A. Yates, 314 Beaver Hall Hill; plastering, Thos. Lister, care of owner; tiling, Brown & Son, 26 Victoria Square, Montreal.

T. Frennette, 615 Garnier St., has the masonry contract, and C. Laviguer, 1037 Blvd, Gouin, roofing and plumbing for residence being erected near 3300 St. Lawrence Blvd.; owner and builder, P. Latendresse, 3302 St. Lawrence Blvd.

The following have contracts on residence and garage to cost $15,000, Cote St. Antoine Rd., for F. Fortier, 823 Atwater; general contractor, P. Gerard, 288 Blvd. St. Joseph; brickwork, Mr. Brunet, 612 Drolet; roofing, W. Lecompte, 928 City Hall; electric, A. L. Allard, 283 Christophe Colomb; plumbing and heating, Bergerons & Freres, 472 Ontario; plastering, Jos. Menard, 763 Girard.

The following contracts have been let in connection with residence and garage at 64 Ontario Ave.; brickwork and foundations, Fussing & Jorgens. carpenter work, Geo. Roberts; roofing. Geo. W. Reed; plumbing and heating, J. Colford; plastering, G. H. Knott.

Northford Centre, Ont.

C. L. Forler, R.R. No. 2, Baden, is the general contractor for residence being erected to cost $12,000, and will do the roofing and carpentry work; plastering and masonry, J Ruehl, New Hamburg, Ont.; plumbing and heating, J. Steven, New Hamburg; painting, J. Cook, Wellesley.

New Toronto, Ont.

D. Gourlie, 94 Stafford St., Toronto,

is the general contractor for 50 pair residences to cost $300,000 to be erected; owner, New Toronto Homes Syndicate

Quebec, Que.

Louis, Girard, 42 Bougainville St., is the general contractor for 6 family residences to cost $13,200, being erected on Bougainville St.; 3½ stories, 40 x 52.

St. Lambert, Que.

H. Dufresne, 44 St. Mathieur St., Ville St. Laurent, is the general contractor for 65 residences to be erected at a cost of $200,000; architect, Raoul Gariepy, 15 St. James St., Montreal; owner, Metropolitant Housing Co., Montreal.

Toronto, Ont.

D. & G. Lynch, 62 Marchmont Rd., have received the heating and plumbing contract for two residences being erected at 117-179 Willard Ave., at a cost of $7,500 each.

Moss & Stocks Electric Co., Toronto, have the electrical contract for residence being erected at 25 Oriole Gardens; owner, Lionel E. Porter, 61 Forest Hill Road.

Walls are now going up for residence being erected on Dunvegan Road; owner, G. S. Homestead, care architect, J. Mitchell, 55 Isabella St., Toronto; masonry, Saul & Page; carpenter work, H. Mawers.

Harry Graham, 50 Fairview Ave., is owner and builder of 5 bungalows being erected n. w. corner Ardagh and Durie Sts., to cost $6,000 each; 2 stories, brick construction; electric, David Firth, 79 Laws Ave.; heating and plumbing, J. R. Armstrong. painting and plastering by owner; masonry, day labor.

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STANLEY MOSS MANAGER

FIDELITY AGENCY
OF CANADA LIMITED
THIRTY SIX TORONTO STREET

Walls are going up for residence and garage to cost $10,000, on north side Glenrose Ave. near Clifton; owner, Wm. F. Christie, 14 Isabelle St.; general contractor, Samuels & Marcus, 301 Glenholme Ave.; heating and plumbing, Wm. Howard, 43 Howland Ave.

Excavating to start on three pair residences to cost $30,000, east side Osler Ave., near St. Clair; owner and builder, S. Rostrum, 340 Osler Ave.; electric, B. C. Taylor, 123 Ellsworth Ave.; heating, W. C. Weeks, 4 Bird Ave.; plumbing, Jas. Penn, 115 Blackthorne Ave.

Walkerville, Ont.

Walls are now going up on $18,000 residence, Nanohoe St.; owner, E. C. Griggs, 1025 Ouellette Ave.; general contractor, Prince Bros.; electric, Ford Electric Co., Ford, Ont.; plumbing and heating to be let.

Windsor, Ont.

C. H. Clarke, 1231 Pelissier St., is the owner and general contractor for a residence being erected on Wyandotte St., at a cost of $18,000. 2 stories, 38x65, tile and brick construction.

Power Plants Electricity and Telephones

Estevan, Sask.

A by-law will be submitted to the ratepayers on Tuesday August 14, authorizing the expenditure of about $22,000 for the installation of new engine and generator.

Ford City, Ont.

Tenders to close August 10 are being called by the Ford Motor Co. of Canada, Ltd., on plumbing and heating for new power house and screen house being erected at a cost of $300,000; architect, Albert Kahn Limited.

Griffin, Sask.

Tenders were received by the Innes Rural Telephone Co. Ltd., for 2¾ miles extension to the present system.

Jonquiere, Que.

The town council contemplate extension to hydro electric power development to cost $75,000.

Lethbridge, Alta.

Work is to commence soon on the extension to power line, which will cost $10,000.

Nelson, N. C.

Tenders for the erection of a $60,000 power line were received by the City Council.

Point du Bois, Man.

Tenders will be received by C. J. Brown, city clerk, Winnipeg, till August 20 for the supply and erection of 3 horizontal shaft turbines and governors; specifications and form of tender with the Hydro-electric System, 55 Princess St., Winnipeg, Man.

Port Colborne, Ont.

The Town Council has purchased a site to permit of new sub-station required to replace present sub-station which will be expropriated by Dept. of Rlys. & Canals.

St. Jacobs, Ont.

Plans are being prepared by the Ontario Hydro Commission for power line from the above point to Linwood, Ont.

Sault Ste. Marie, Ont.

Hope Lumber Company, Thessalon, Ont., will shortly commence work on dams here to cost $60,000. The company does its own engineering work.

Sherbrooke, P. Q.

The city council are having plans prepared for the reconstruction of the Frontenac power dam with reinforced concrete, at a cost of $20,000.

Sintaluta, Sask.

Tenders have been received by the Town of Sintulata, Sask., for construction of Bishop Rural Telephone Line.

Sombra Township, Ont.

The township council is having plans prepared for a hydro-electric system for the township. Engineer, E. D. Lawler, 190 University Ave., Toronto.

Toronto, Ont.

Erection has started on addition to Junction sub-station, value $20,000 for Toronto Electric Commissioners; plumbing, W. G Crawford, 99 Adelaide W.; painting, Fred G. Roberts & Co., 106 Well St.; steel sash, Trussed Concrete Steel Co. of Canada, Ltd., 34 King W., Toronto; roofing, electric, heating and plastering to be let by general contractor.

Wapella, Sask.

Town of Wapella contemplate installing an electric lighting plant. Further details later.

CONTRACTS AWARDED

Abitibi River, Ont.

Sir Wm. Arrol Co. Ltd., Union Bank Bldg., St. Catharines, Ont., have been awarded the general contract for dam and power house at Island Portage for the Hollinger Consolidated Gold Mines, Ltd., 85 Bay St., Toronto. The plant will have a capacity of 25,000 h.p.

Campbellford, Ont.

The Sinclair Construction Co. Ltd.,

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Resources over - $31,790,000
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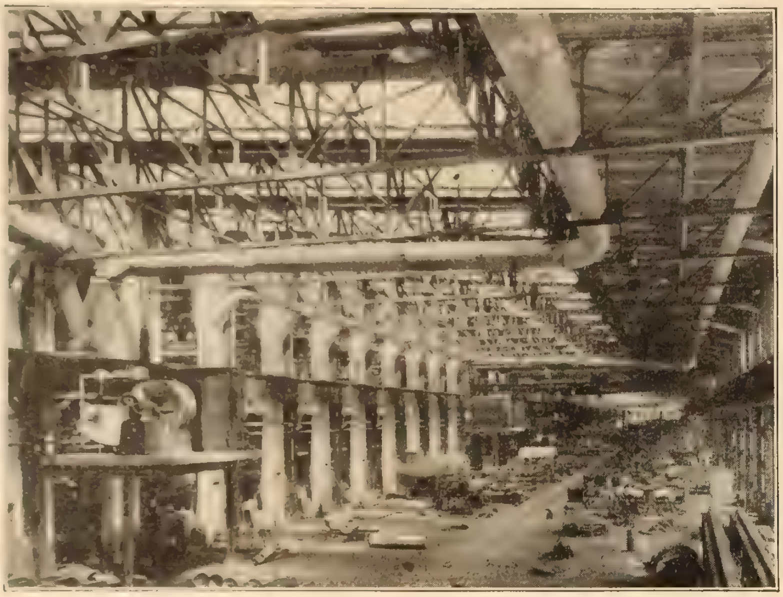

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Montreal Galt Toronto

Excelsior Life Bldg., Toronto, has been awarded the general contract for the construction of power house, foundations and tailrace at Dam No. 1, Trent River, in connection with the $250,000 development here for the Hydro-electric Power Commission of Ontario, University Ave., Toronto.

Canwood, Sask.
The Valbrand Rural Telephone Company, of Canwood, has awarded the contract for extension to telephone system at a cost of $9,000, to T. J. McVicar, 2827 Regina St., Regina, Alta.

Montreal, Que.
Walls are going up for $45,000 power house on Beaumont Street; general contractor, W. M. Irving, 26 Stanley St., masonry, Canadian Hydro Stone Ltd; electric work day labor by owners.

St. Albans, Que.
Foundations are in for power development plant to cost $250,000 for La Cie Hydrolique de Portneuf; general contractors, Estrup & Conradi Construction Co., St. Catharines, Ont.; owners are in the market for 2 generators, 2000 C.V. motor and turbine.

Whitecliffe, B. C.
E. Cummings, 140 Fourth Ave., Vancouver, has the contract for a 22-mile power line from Whitecliffe to Britannia Beach, B. C., for the B. C. Electric Railway Co., Hastings & Carroll Sts., Vancouver.

Miscellaneous

Batiscan, P. Q.
Romeo Morrissettee, Engineer, Cap de la Madeleine, P. Q., wants prices at once on the following equipment for La Cie Aqueduct, Batiscan, P. Q.: 1 wooden storage tank, capacity 100,000 gals., to be erected at earth level; one centrifugal pump, size of discharge 2½"; size of intake 4"; capacity of 125 gals. per minute; suction head 10'; discharge head 110'. One centrifugal pump; size of discharge 2"; size of intake 4"; capacity 75 gallons per minute; suction head 10'; discharge head 110'. Both pumps to be supplied by short artesian wells. Also the proper motors, one electric and the other gasoline.

Britannia, Ont.
Messrs. Ross Meagher Co., Laurentian Bldg., Ottawa, has the general contract for the construction of retaining wall here for Joseph Meagher, Laurentian Bldg., Ottawa.

Hamilton, Ont.
The Harbor Commission 47½ Main St. E., is contemplating the laying out of a park on the bay shore, between James & Catharine Sts. Superintendent of the commission, Wm. Ainslie.

London, Ont.
John Hayman & Sons, 432 Wellington St., are having plans prepared for a central heating plant. This work will also involve the construction of a tunnel under street. Prices are wanted on all materials and equipment.

Port Colborne, Ont.
The C. N Rly. contemplate building a station at Port Colborne, as their present station is in path of new Welland Canal.

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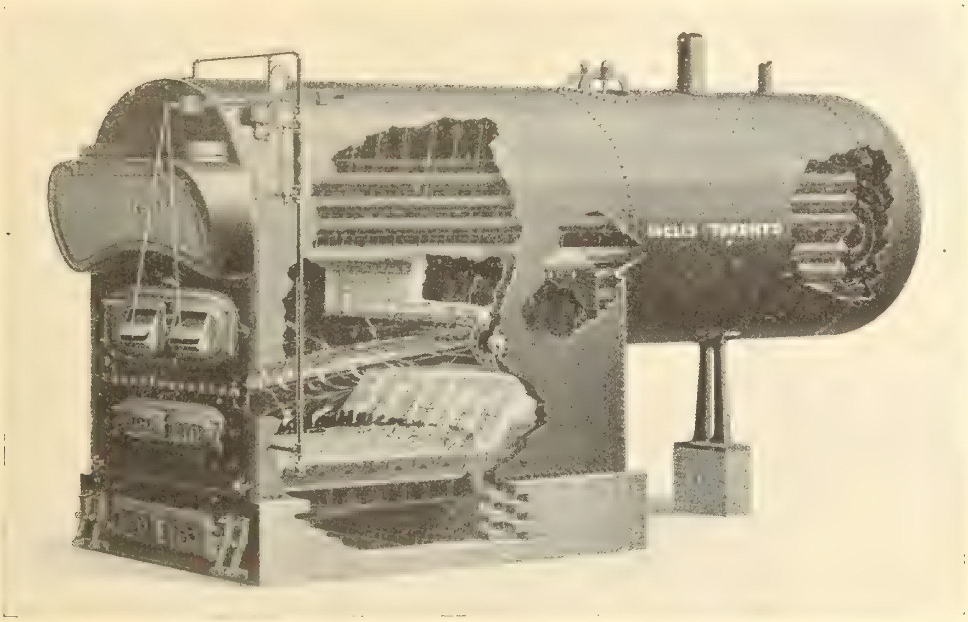

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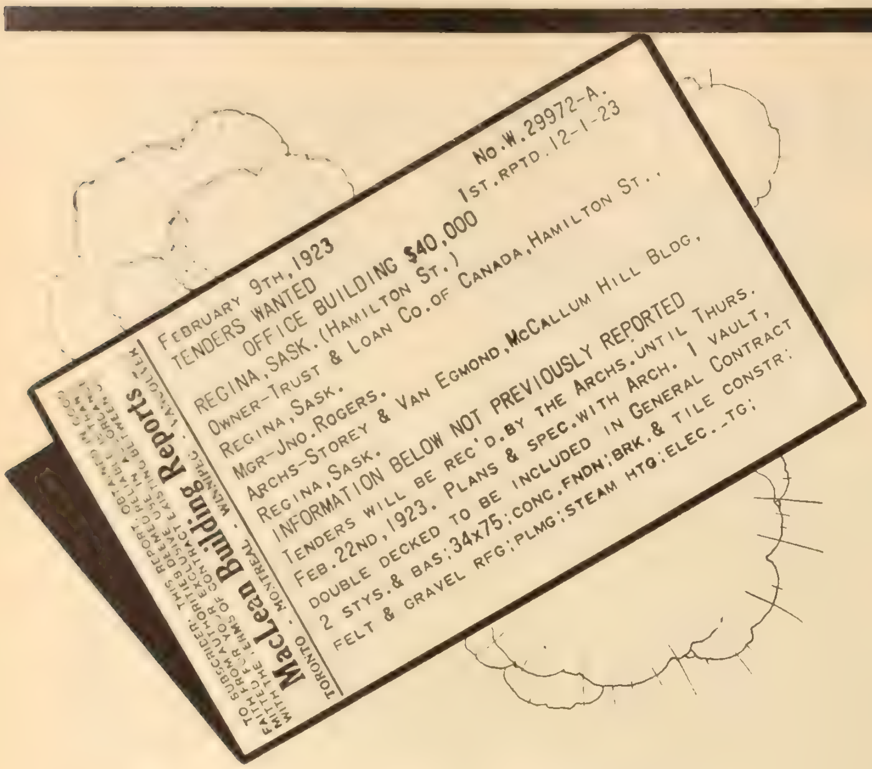

MacLean Building Reports

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REGINA, SASK. (HAMILTON ST.)
OWNER—TRUST & LOAN CO. OF CANADA, HAMILTON ST.,
REGINA, SASK.
MGR—JNO. ROGERS.
ARCHS—STOREY & VAN EGMOND, MCCALLUM HILL BLDG,
REGINA, SASK.
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TENDERS WILL BE REC'D. BY THE ARCHS. UNTIL THURS.
FEB. 22ND, 1923. PLANS & SPEC. WITH ARCH. 1 VAULT,
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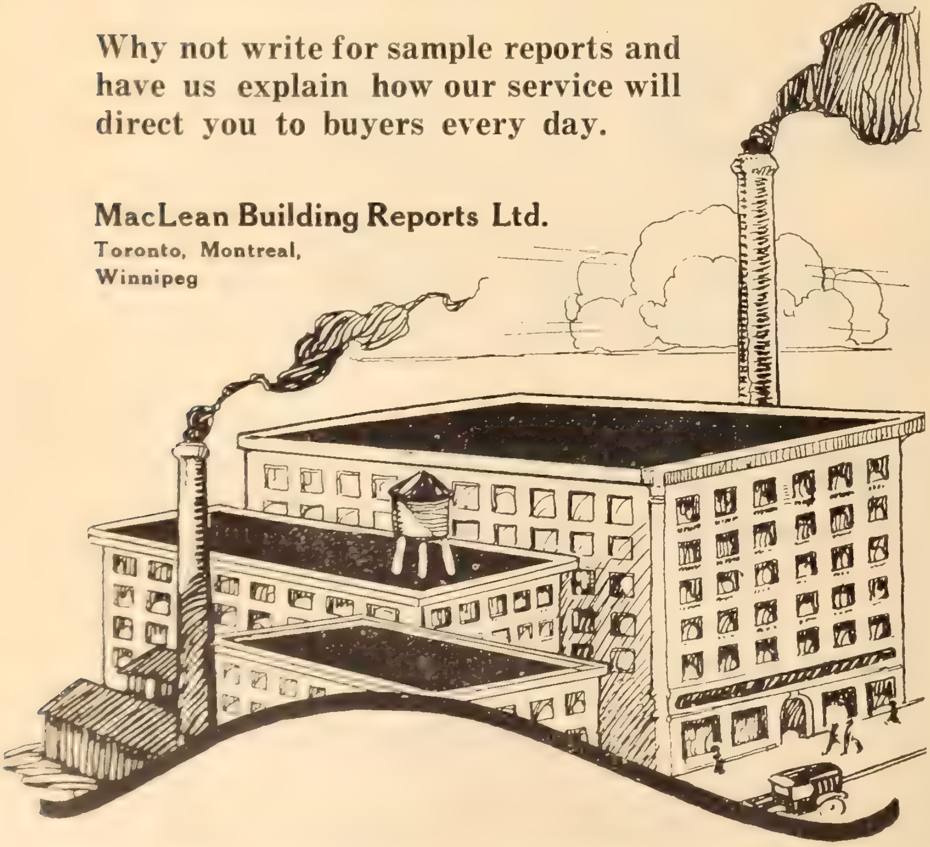


To Use More Asphalt in Japan

Most of the paving in Japan was formerly of Japanese pine but some ot the streets of Tokyo are now to be paved with Douglas fir blocks which are to be manufactured and creosoted locally. However, more durable roads are planned for this city, and it is estimated that before the end of 1926 the percentage of various kinds of paving will be about as follows: wooden-block paving, 11 per cent; stone, 5 per cent; asphalt, 52 per cent; and asphalt macadam, 32 per cent.

Alberta's Oil Supply

Enough oil is obtainable in Alberta to supply the world's requirements for over 600 years, according to Thomas S. Howson of Vancouver, an expert in oil production and refining. He referred to the oil contained in the vast fields of bituminous sand in the district of McMurray, on the Athabasca River and on the Slave River.

Wood Stave Pipe

In developing hydro-electric power on the Oswegatchie River in Northern New York a wood-stave pipe is beng constructed twelve feet in diameter and more than two-thirds of a mile long. The staves are of Douglas fir brought from the State of Washington. They are 3½ inches thick and are able to sustain a head of water of 140 feet.

Jerusalem Will Have Hydro

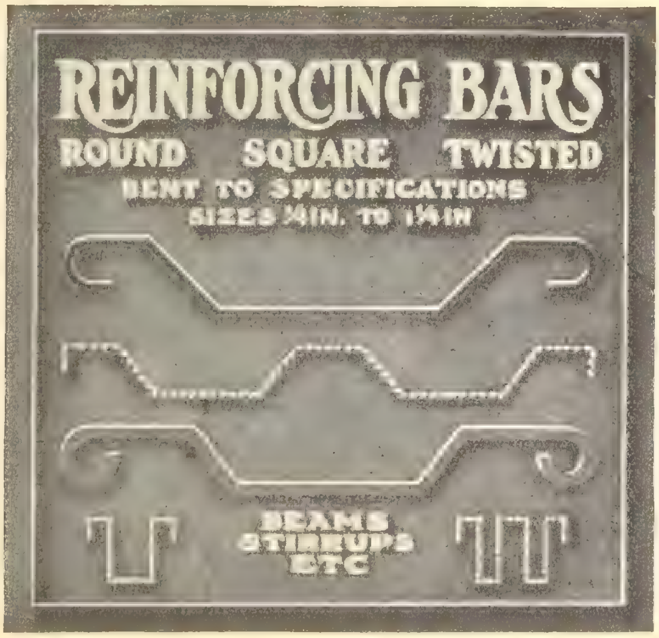
Modern conveniences are forcing their way to the front in the Holy Land. The British Government has granted concessions for the establishment of two big hydro-electric plants along the banks of the River Jordon; and from these installations the City of Jerusalem will be supplied with current for light and power purposes. It is estimated that 1,000,000 horsepower can thus be generated and that water can be impounded by the dams in sufficient measure to irrigate 1,200,000 acres of the neighboring land. The execution of the undertakings will give direct employment to 3,000 men and indirectly open up fields of activity for a much larger number. About $5,000,000 will be required to carry out the projects.—"Compressed Air Magazine."

Philadelphia Opens Plastering School

Plastering is now being taught in the South Philadelphia High School on Saturday from 8 to 12 a.m. The students are identured apprentices, already working at the trade, and the plastering course is the outcome of co-operation between the Master Plasters Company, the Operative Plasters' Protective Association, the Philadelphia Building Congress and the Board of Education. The course covers the use of tools, mixing of materials, scratching or first coat, second coat work, straightening up walls, white coating, finishing plain walls, simple ornamental work, laying out and running work in place, advanced ornamental work, making coatings, etc. Related work is also given in the course, such as drawing, plan reading, mathematics, estimating, business practice, specifications, lectures on materials, history of the trade, general building construction, civics. English and hygiene.

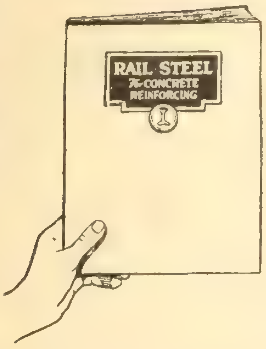
BURLINGTON STEEL COMPANY, LIMITED

HAMILTON **CANADA**



Bars are shipped bundled and tagged ready for placing.

Bending



Send for This Valuable Book—FREE

The first and only authoritative and comprehensive treatise on concrete Reinforcing Bars and containing most important information on the manufacture, qualities, and use of Rail Steel Bars.

Specification A-16-14 requires that Rail Steel Bars be bent around a mandrel whose diameter is four times the diameter of the bar, and to the following angle:

Bars under ¾ in.—180°
Bars ¾ in. and over— 90°

Is it the fault of the steel, if a 1 in. bar inserted in a gas pipe refuses to stand a 135° bend? But you will say, "Contractors handle steel roughly on the job, and I propose to use structural grade steel that will stand rough treatment." Will you do that and sacrifice 25% in factor of safety, and at the same time use 20% more steel for which the owner pays?

"You don't design sharp bends in your reinforcing steel. If you'll insist that your contractor bends your steel as designed, Rail Steel Bars will easily stand every bend—saving you 20% in the cost of your steel, and at the same time increasing your factor of safety by 25%.

Specify your reinforcing to meet A.S.T.M. specifications A-16-14, or equal

Current Prices of Building and Engineering Materials

Item	Unit	Toronto	Montreal	Winnipeg	Vancouver
CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.45
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	10.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	25.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*†	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	25.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M.	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00**	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base	4.00 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.40 "	4.00 "	5.10 base	
Hoops	per 100 lbs.	5.00 "	3.75 "		
Twisted and deformed bars	per 100 lbs.	3.90 "	4.00 "	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	4.00 "	4.00 "	5.35	6.00
Structural shapes	per 100 lbs.	3.90 "	4.25 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.15	6.25
Plates—3/16 in.	per 100 lbs.	4.40 "	4.25 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.50 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.50 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
Cast iron pipe	per ton	65.00 "	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.45	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.80.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.

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That the Inspector made the famous *cut test* insuring that all details of the Specification had been carried out;

That the Inspector saw the heavy top coat of pitch *poured* (not mopped) and the gravel or slag surface properly imbedded.

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Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	94.50	65.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	45.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	135.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	145.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.25	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	70.00
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	15.00	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	14.50
Putty in bulk	per cwt.	5.95	4.25	5.50	6.50
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.38	1.40	1.26	1.56
Raw linseed oil, in bbls.	per gal.	1.35	1.38	1.23	1.53
Turpentine, in bbls.	per gal.	1.60	2.20	2.50	2.80
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	26.00
Plaster of paris, in bbl. lots	per bbl.	6.00	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.35	1.00
Plasterers	per hr.	1.25	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers (Common)	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Laborers (Skilled)	per hr.	.60-.70			.90
Sheet Metal Workers	per hr.	.80			

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

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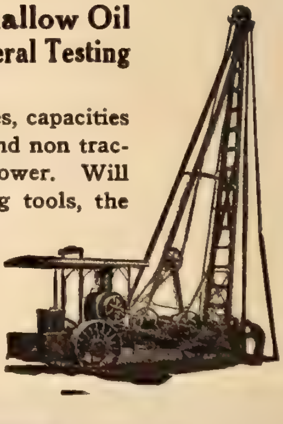

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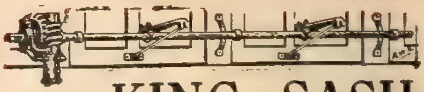

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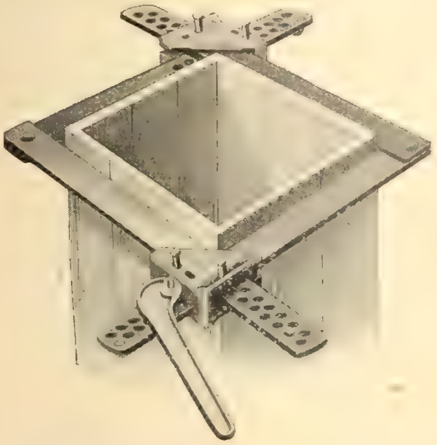

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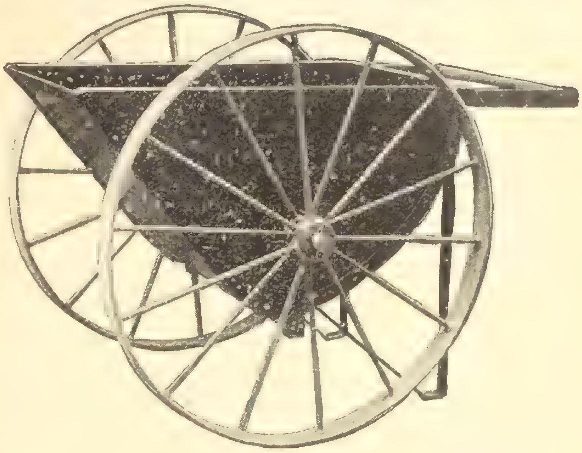

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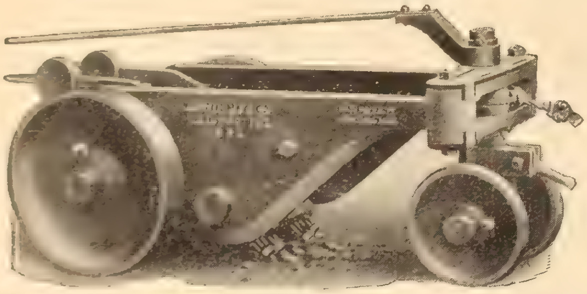

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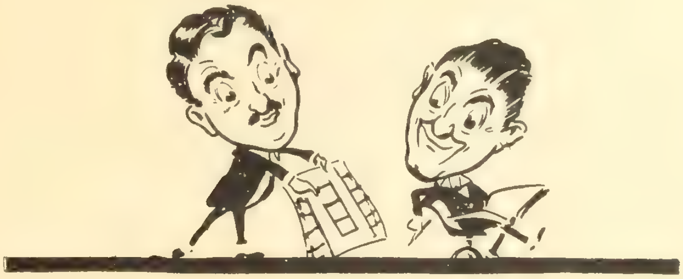

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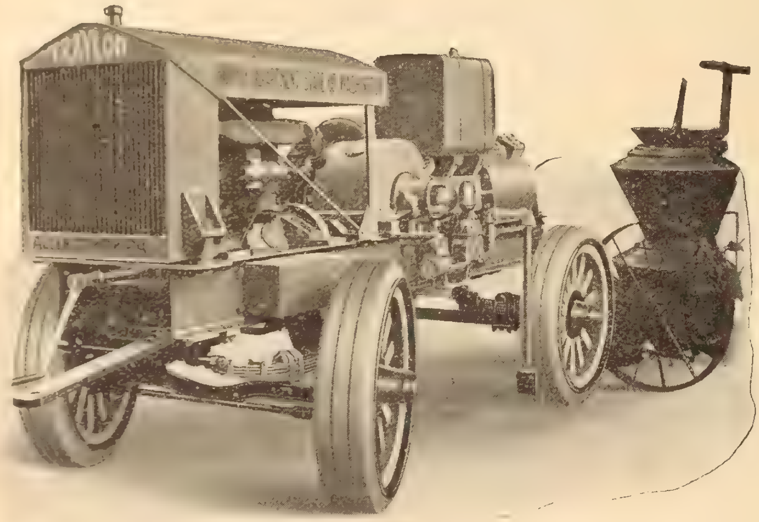

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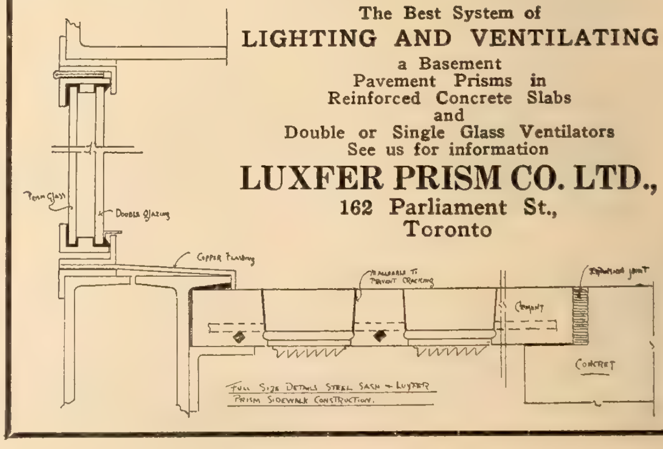
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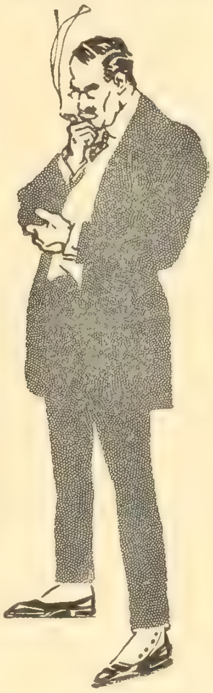

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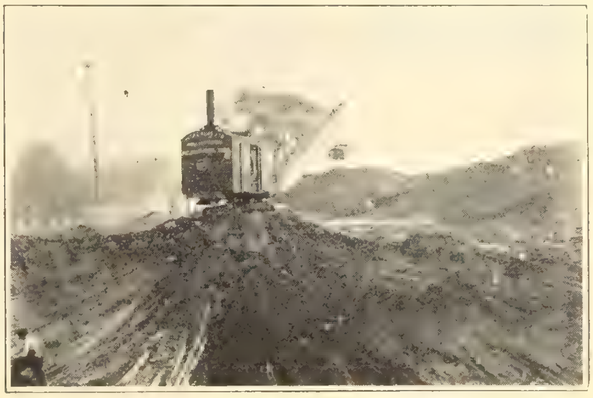

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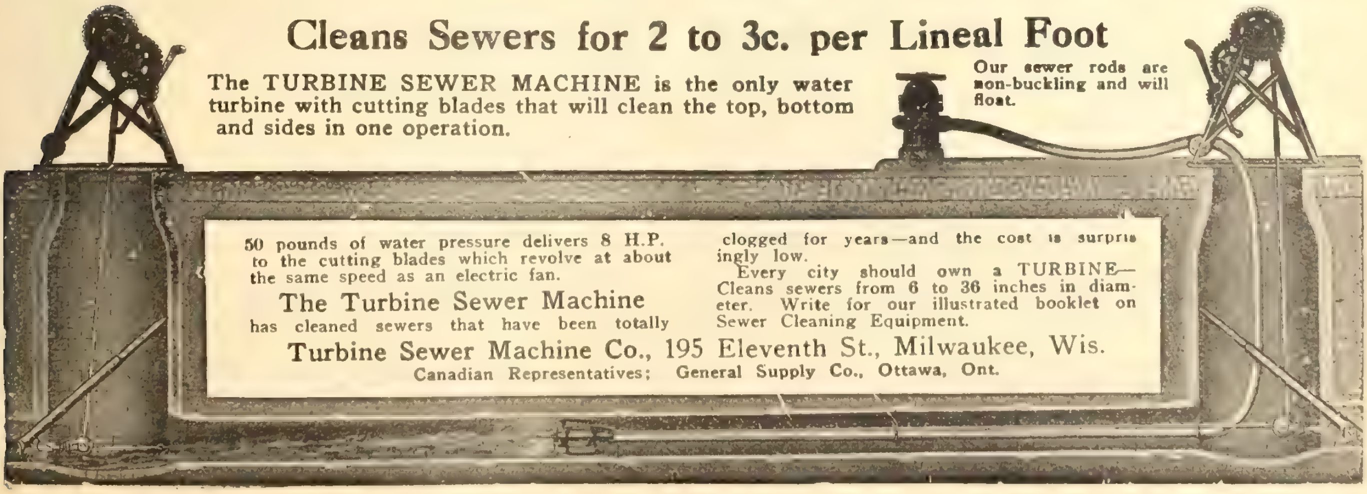

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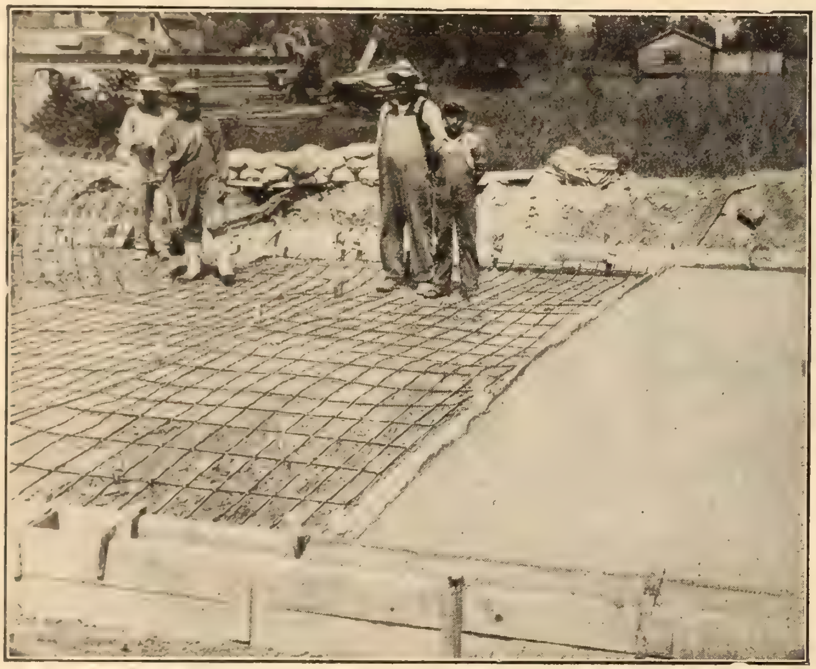

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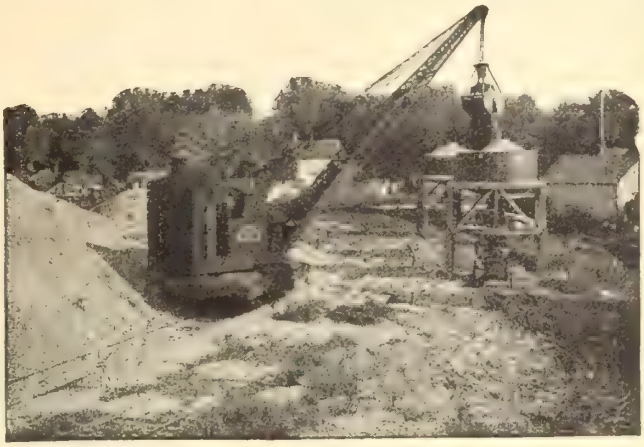

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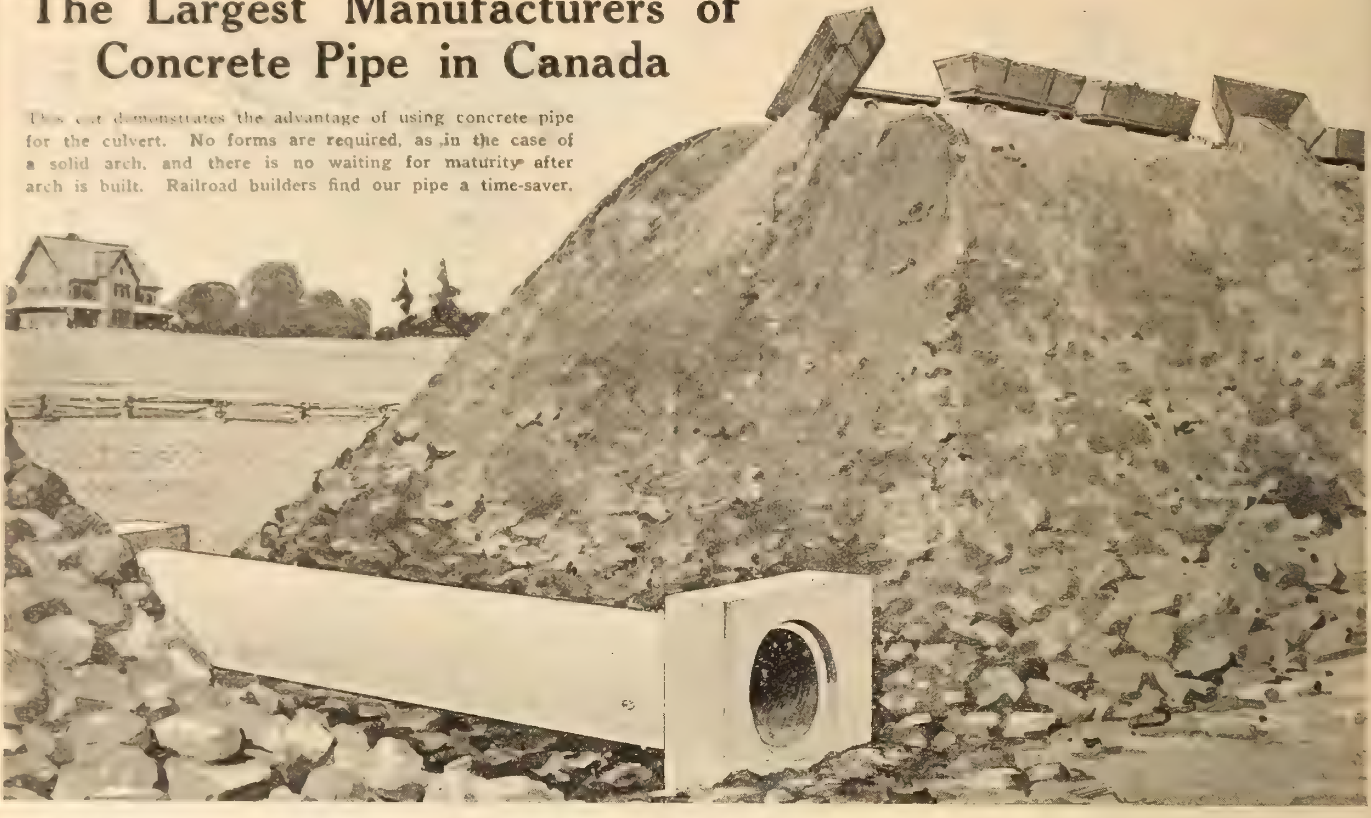

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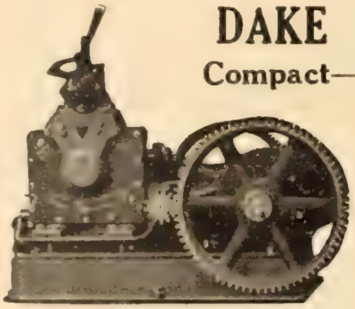

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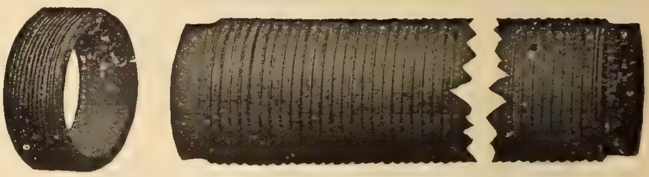

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"CAST IRON PIPE has the Greatest Resistance to Corrosion."

BELL and SPIGOT and FLANGED CAST IRON PIPE: SPECIALS and CASTINGS of all kinds: CAR WHEELS

HEAD OFFICE:
Mark Fisher Bldg., Montreal

Works at: Fort William, Ont., St. Thomas, Ont
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At Your Service

Turnbull Passenger Elevators are to be found in the finest buildings throughout Canada. Where dependable service is demanded, you will find Turnbulls silently and efficiently doing their work.

Turnbull Elevators in appearance and performance are the elevators most suitable to apartment houses, public buildings, stores, etc., where they become part of the most exclusive surroundings.

It will give us pleasure to furnish particulars about Turnbull Passenger and Freight Elevators to contractors, architects or other interested parties, without cost or obligation.

The

TURNBULL ELEVATOR COMPANY

LIMITED

HEAD OFFICE & WORKS:
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MONTREAL BRANCH:
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THE DOMINION WIRE ROPE CO. LIMITED
MONTREAL

Our Greatest Asset—

Hundreds of Satisfied Customers
Who Always Specify

"DOMINION"

On Repeat Orders

The Dominion Wire Rope Company, Limited

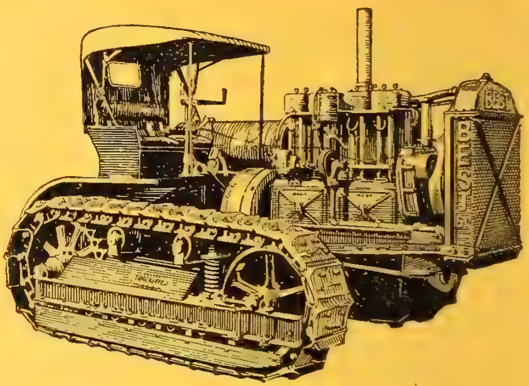
Head Office: MONTREAL Branches: TORONTO and WINNIPEG

The "BEST":

A HEAVY DUTY ALL-PURPOSE

TRACTOR

for Contracting or Hauling Road Building, Logging, Farming, etc.



"Reliance" Crushers

Increase Capacity, Eliminate Vibration and Save Power

Materials and Workmanship of the Highest Grade

Let Us Estimate on Equipment for Your New Contract!

Branch:
108 Mail Building,
TORONTO
Telephone Adelaide 840

F·H·Hopkins & Co.
Limited

Head Office
MONTREAL
Telephone Main 3420

Vol. 37 Toronto, August 15, 1923 No 33

Contract Record and Engineering Review

There is a Reason

justifying the transportation of lumber across the continent for constructing wood stave penstock.

It is based on low annual charges due to long life and excellence of material.

B. C. (Douglas) Fir Pipe, installed on Atlantic Coast

Wire Wound Wood Pipe

Steam Pipe Casing

Tanks for all purposes

Conduit

120" Diam. Wood Pipe, Nova Scotia

Pacific Coast Pipe Co., Limited

1551 Granville Street - - Vancouver, B.C.

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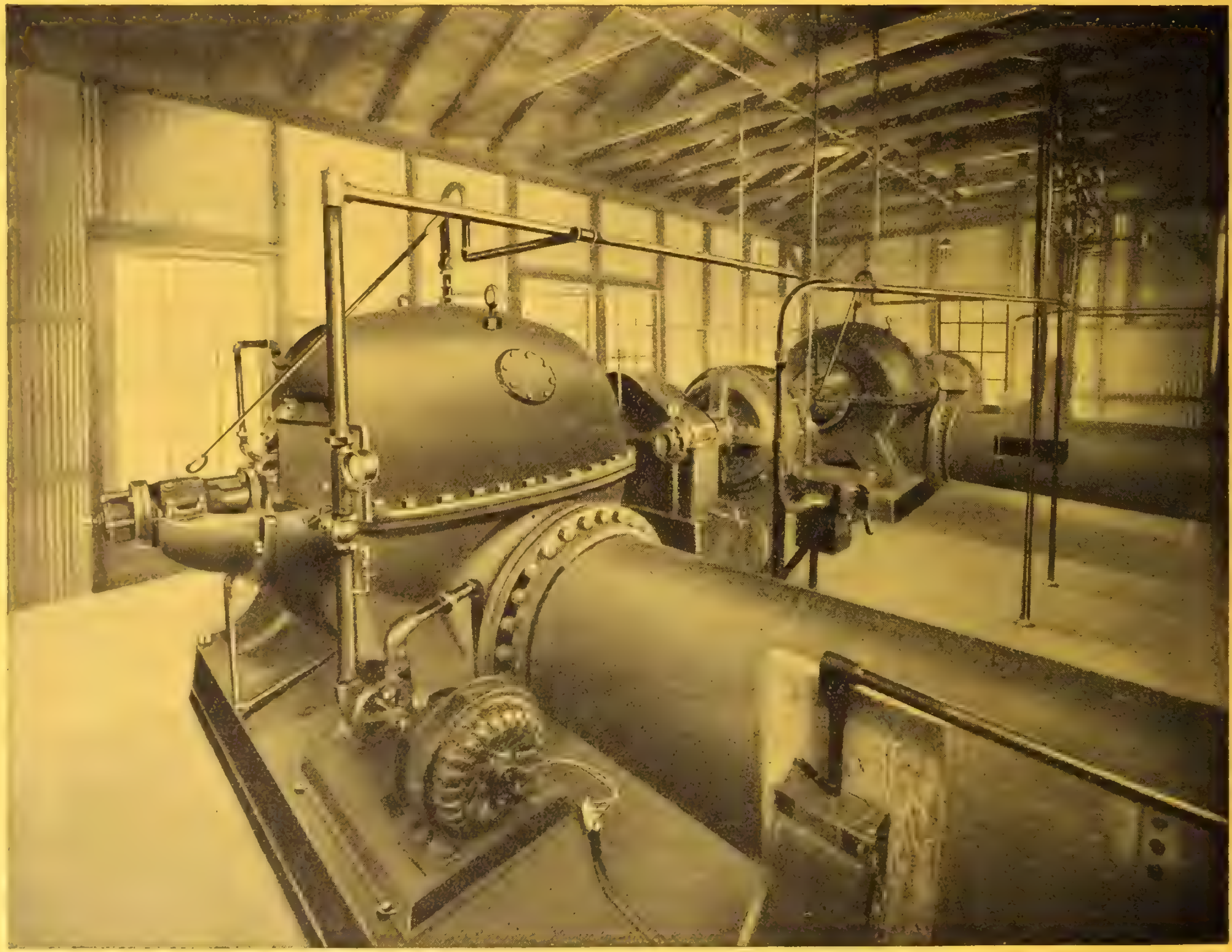
THE REES RoTURBo

A Centrifugal Pump for Any Service



Showing two 30″ Rees Roturbo Pumps, (23,000 Imp. Gals. per minute) at the Maple Ridge Dyking District

REES RoTURBo PUMPS ARE SELF REGULATING

They automatically adjust themselves to sudden Drop or Overload without injury to themselves or the prime mover, and they assure a high and constant efficiency over a wide range of duties.

Municipal and Industrial Plants all over Canada are installing REES RoTURBo PUMPS.

Catalogs and further information on request

THE GOLDIE & McCULLOCH CO., LIMITED

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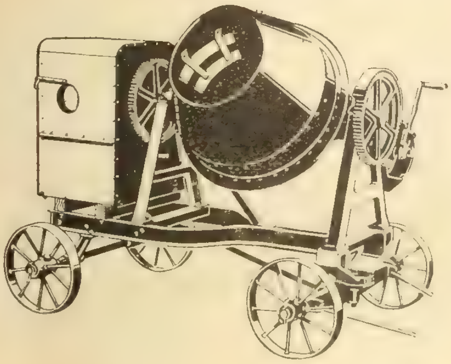
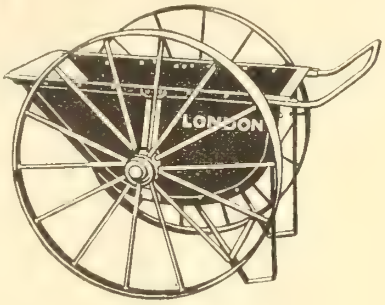
Contractors and Engineers



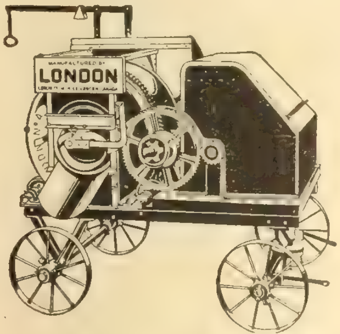
London Mixer, made in two sizes

entrusted with large contracts specify "LONDON MACHINES" not on account of the price, but because they will run continuously under the most exacting conditions.



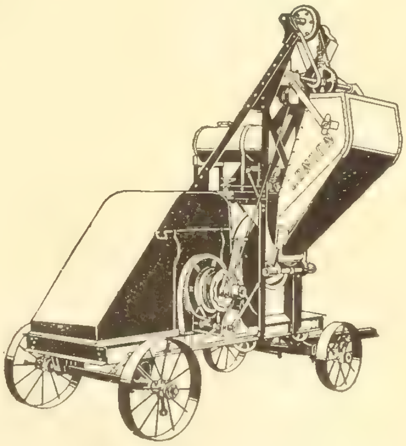
London Concrete Cart No. 6

Every machine built in our own factory under the most modern methods and sold under a guarantee of absolute satisfaction.



London Mixer. Made in three sizes

Our enormous business has been made possible by many satisfied customers. Every machine sold sells many more . This is the best guarantee possible. **"ASK THE MAN WHO USES THEM."**



London Mixer. Made in six sizes, with Steam, Gasoline or Electric Power

Made in Canada

We manufacture Concrete Mixers, Hoists, Air Compressors, Pumps, Brick, Block and Tile Machines, Barrows, Carts, Silo Moulds, Ornamental Moulds and Tools.

The London Concrete Machinery Co., Limited

Dept. 3 London, Canada

World's Largest Manufacturers of Concrete Machinery

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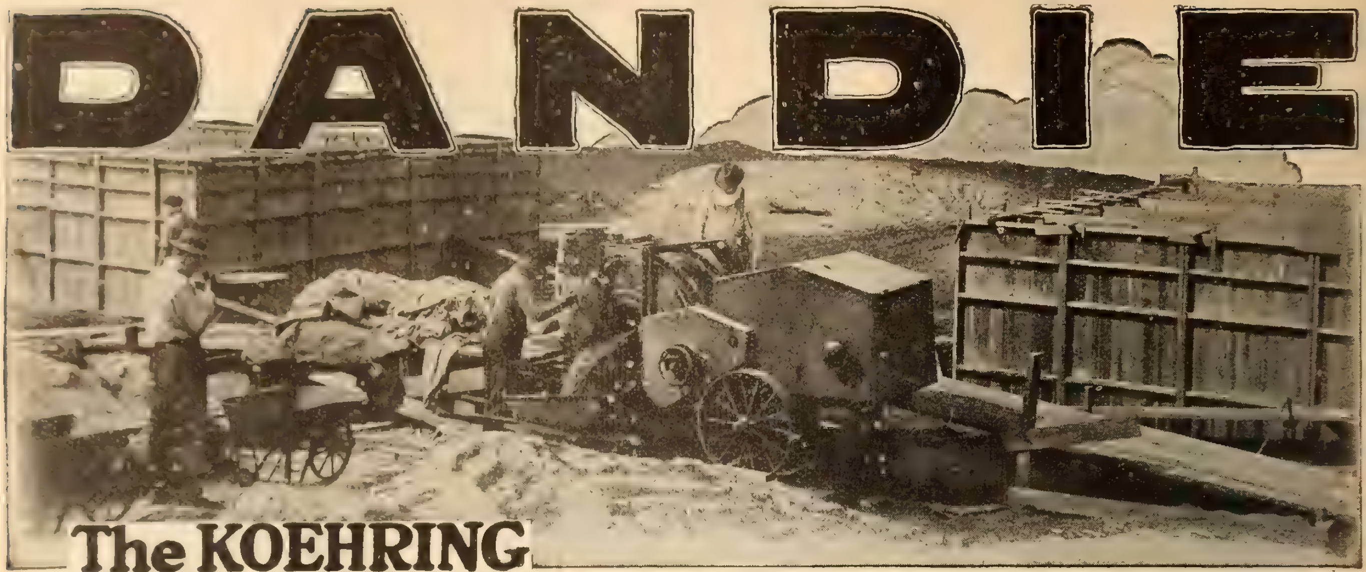
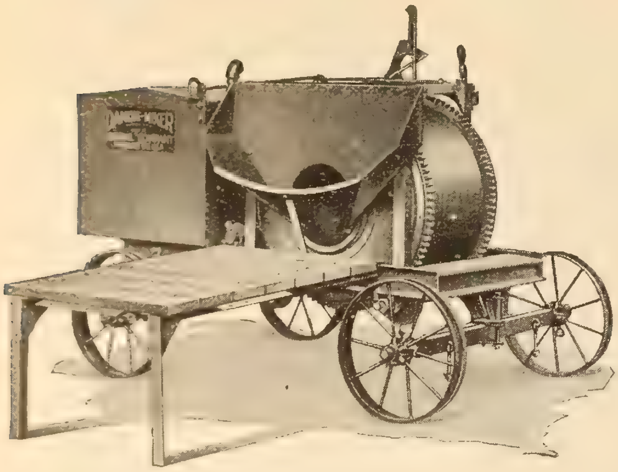
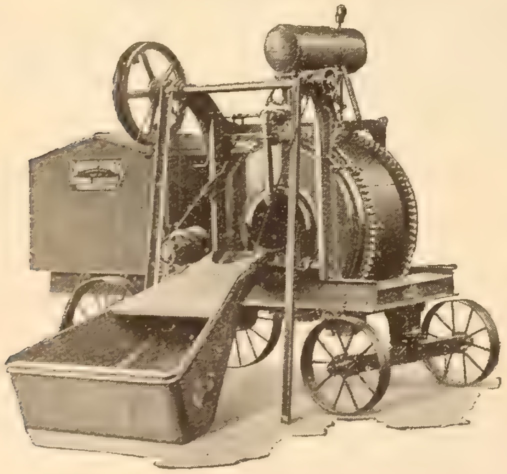


The KOEHRING
Light Mixer



104 S 4 Cubic Feet Mixed Concrete



107 S—7 Cubic Feet Mixed Concrete

Get the Price — Get the Specifications

NO, it's not the cheapest mixer in price—but it is the greatest *value* in the light mixer class and it is within the light mixer price range. It will outwork, outwear and outlast ordinary light mixer construction. It will still have a long profitable future ahead of it, when the ordinary light mixer is costing you big money to keep it out of the junk pile!

Send back the coupon. Get the Dandie catalog that informs you how to judge mixer values. You'll find it a practical, helpful, money-saving booklet.

Dandie Capacities

4 and 7 cu. ft. mixed concrete, steam and gasoline. May be equipped with power charging skip, low charging platform, light duty hoist, automatic water measuring tank. Mixes mortar as well as concrete. Send back the coupon today.

KOEHRING COMPANY OF CANADA, LTD.,

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Toronto, Ont.
Phone: Main 1498

616 Canada Cement Bldg.,
Montreal, Que.
Phone: Uptown 3026

Ottawa, E. N. & W. E. Soper, 63 Sparks St., Phone: Uptown 3435

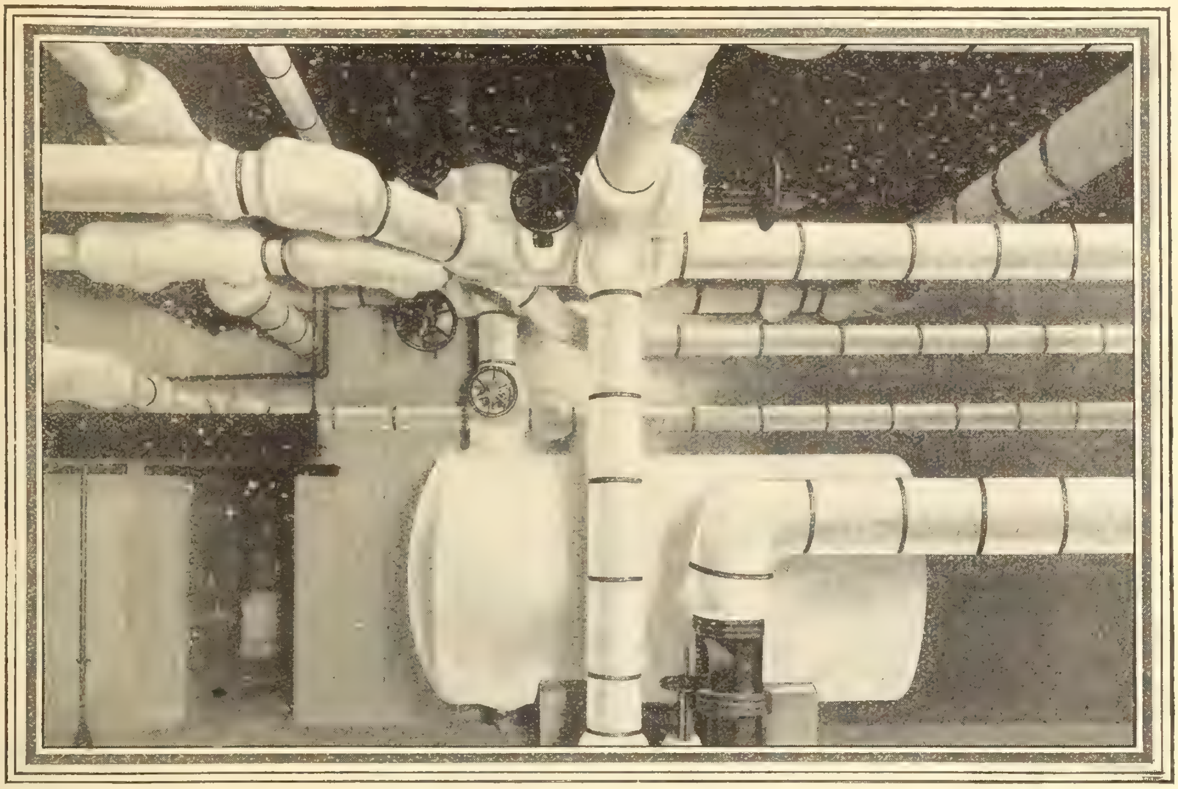
Koehring Company of Canada
Limited,
Toronto, Ont.

Please send me Koehring Dandie Mixer Catalog No. 34 and give full information on interchangeability for mixing concrete and mortar.

Name ....

Address ....

....



THIS CRANE PIPING CONTRIBUTES TO THE SAFETY AS WELL AS THE WORKING EFFICIENCY OF A LARGE CENTRAL STATION

INSURING SAFE HIGH PRESSURE PLANTS

Meeting the need of the modern power plant for piping equipment to handle high pressure superheated steam, Crane Ltd. has produced a complete line of valves, fittings and steam specialties of cast-steel and monel metal. The use of these materials overcomes the "growth" or permanent expansion encountered with cast iron, malleable iron or semi-steel units which are subjected to wide temperature variations. Crane cast-steel equipment retains its original size and strength under the most severe conditions, insuring permanently tight connections and maximum safety.

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Crane "Barracks" Lavatories

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  - MacKinnon Steel Company
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  - Canadian Blower & Forge Co.
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(Continued on page 8)

Bracing Weather ā la Carte

Stormy without but ALWAYS dandy weather within for attracting guests, holding tenants and to pep up salesmen, snap up workmen or speed up scholars and office workers.

Get these advantages by passing the air they breathe through a rain storm, moisture eliminators, dirt removers, and—in cold weather—heater coils all within a

Carrier Air Washer

This machine removes buckets of filth and germs from the air in a surprisingly short time. Improved attendance and production records as well as the profit sheet record the results.

Tell us your special conditions and we will promptly co-operate without obligating you.
Write Dept. 12.

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  - Sturtevant, B. F. & Co.
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- **Electrical Specialties**
  - Spielman Agencies Regd.
- **Electrical Contractors**
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  - Canadian Blower & Forge Co.
- **Furnaces**
  - H. Mueller Mfg. Co., Limited
- **Gantry and Cantilever Cranes**
  - Orton & Steinbrenner Co.
- **Gasoline Engines**
  - London Concrete Machry. Co.
- **Gears (Cut)**
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- **Gravel**
  - Allen Bros.
  - Brantford Sand & Gravel Co.
  - Paris Sand & Gravel Co.
  - Rogers Supply Co.
- **Hammer Drills**
  - Canadian Ingersoll-Rand Co.
- **Hardware**
  - Hardware Co., of Toronto
  - Mercer Bros.
- **Hardwood Flooring**
  - Eaton & Sons, J. R.
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  - Lumsden Engineering & Transport Co.
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  - Crane, Limited
  - Sturtevant, B. F. & Co.
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  - Canadian Austin Machinery
  - Canadian Link-Belt Co.
  - Clyde Iron Works Sales Co.
- **Hoists (Truck)**
  - Dominion Truck Equipment Co.
  - Wood Hydraulic Hoist & Body Co., Ltd.
- **Hoisting Apparatus**
  - Canadian Austin Machinery
  - **Canadian Ingersoll Rand Co.**
  - Canadian Mead-Morrison Co.
  - Clyde Iron Works Sales Co.
  - Hopkins & Co., Ltd., F. H.
  - Industrial Works
  - London Concrete Machry. Co.
  - Mussens Limited
  - Watson Jack & Co.
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  - Canadian Mead-Morrison Co.
  - Clyde Iron Works Sales Co.
  - General Products Co.
  - Hopkins & Co., Ltd., F. H.
  - Koehring Co., of Canada
  - London Concrete Machry. Co.
  - McGovern, T. J.
  - Mussens Limited
  - Turnbull & Co., Harvard
- **Hydrants**
  - Canada Iron Foundries
  - Dominion Steel Products Ltd.
  - Kerr Engine Company
  - Gartshore-Thompson Pipe Co.
  - McAvity & Sons, T.
  - Hepburn, Ltd., John T.
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  - Muldoon, Ltd., J.
  - Standard Lime Co.
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  - **Canadian Ingersoll Rand Co.**
  - York Manufacturing Co.
- **Industrial Cars**
  - Canadian Austin Machinery
  - Canadian Equipment Co.
  - Hopkins & Co., Ltd., F. H.
  - **MacKinnon Steel Company**
  - **Mussens Limited**
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  - Canadian Inspection & Testing Laboratories
  - Hunt & Co., Robt. W.
  - Milton Hersey Company
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  - Imperial Oil Company, Ltd.
  - Spielman Agencies Regd.
  - Standard Underground Cable Co., of Canada Ltd.
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  - Hamilton Bridge Works Co.
- **Joist Hangers**
  - Hamilton Bridge Works Co.
- **Kilns**
  - Canadian Blower & Forge Co.
  - MacKinnon Steel Company
- **Lead Pencils**
  - American Lead Pencil Co.
- **Lime**
  - Standard Lime Co.
  - **Muldoon, Ltd., J.**
- **Hydrated Lime**
  - Standard White Lime Co.
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  - Ball Engine Co.
  - Canadian Austin Machinery
  - Canadian Equipment Co.
  - Canadian Link-Belt Co.
  - Erie Steam Shovel Co.
  - General Products Co.
  - Hopkins & Co., Ltd., F. H.
  - Koehring Co., of Canada
  - McGovern, T. J.
  - Mussens Limited
  - Orton & Steinbrenner Co.
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  - Canadian Equipment Co.
- **Locomotive Gasoline and Storage Battery**
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  - General Products Co.
  - Ormsby Company, A. B.
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  - Builders Iron Foundry
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  - **Lincoln Electric Co., of Canada Ltd.**
  - **Sturtevant, B. F. & Co.**
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  - Hamilton Bridge Works Co.
  - Horton Steel Works, Ltd.
  - MacKinnon Steel Company
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  - F. H. Hopkins & Co., Ltd.
  - Orton & Steinbrenner Co.
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  - Dennis Wire & Iron Works Co.
  - Canada Wire & Irons Goods Co.
- **Ornamental Moulds**
  - London Concrete Machry. Co.
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  - Spielman Agencies Regd.
- **Paints and Varnishes**
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  - Spielman Agencies Regd.
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  - Canada Paint Co.
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  - Imperial Oil Company, Ltd.
  - **Spielman Agencies Regd.**
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  - Dom. Tar & Chemical Co., Ltd.
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  - Hopkins & Co., Ltd., F. H.
  - Mussens Limited
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  - Canadian Pipe Co.
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  - National Iron Corporation
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  - Canadian Johns-Manville Co.
- **Rails**
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  - Mussens Limited

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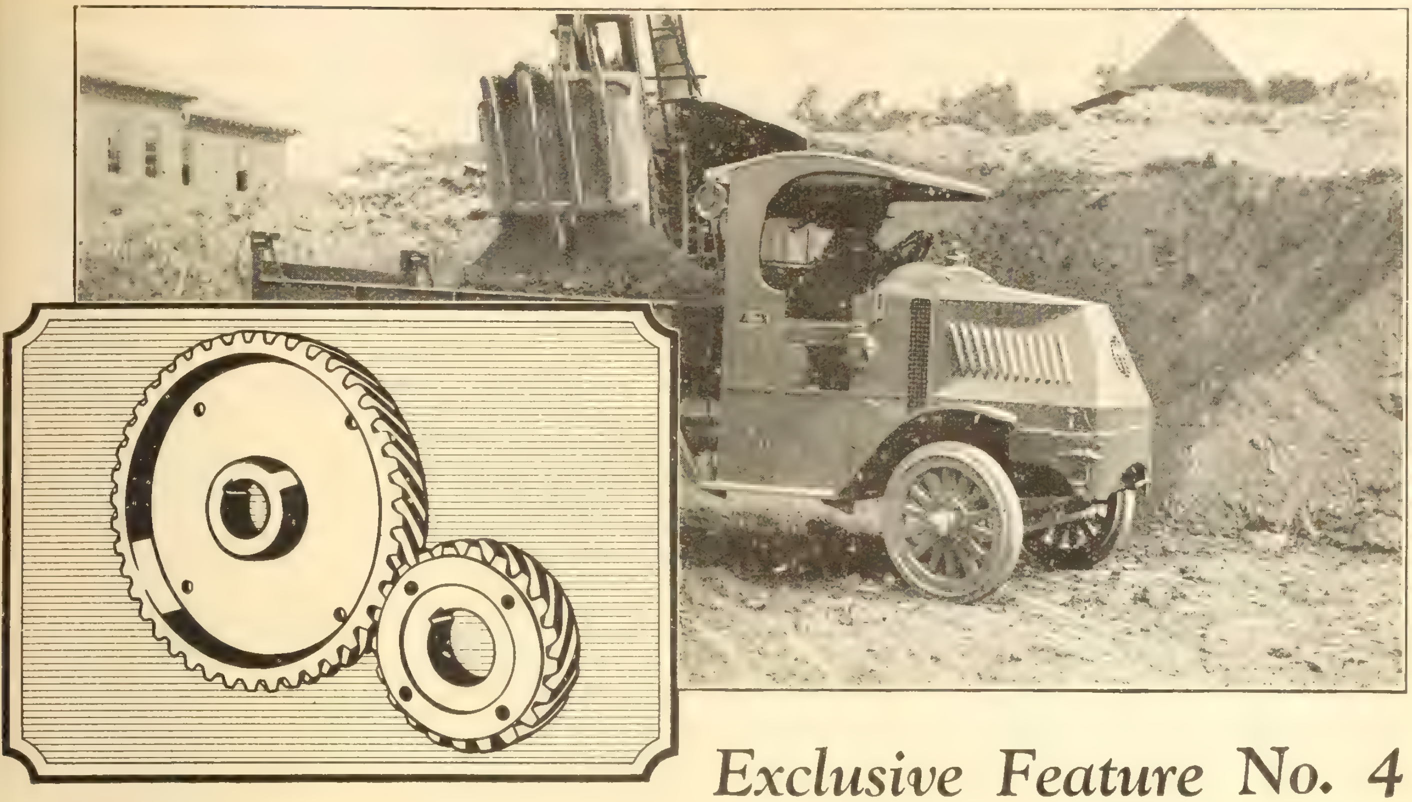

Exclusive Feature No. 4

CASE-HARDENED TIMING GEARS

The 27 exclusive features listed are the result of 23 years of specializing in motor transportation. Each one has played an important part in building the reputation which Mack Trucks have established wherever motor trucks are known.

THE COMPLETE LIST

1— Crankshaft
2— Cylinder Treatment
3— Engine Support
4— CASE-HARDENED TIMING GEARS
5— Water-Cooled Oil Reservoir
6— Double-Screen Oiling System
7— Water Pump
8— Exhaust Manifold
9— Intake Manifold
10— Crankcase Inspection Ports
11— Interrupted Spline Shaft
12— Reverse Gear-Shift Lever
13— Steering Wheel
14— Steering Column
15— Steel Cab Sliding Doors
16— Front Sprocket
17— Pressed Steel Radius Rod
18— Blast Cooled Dash Radiator
19— Beltless Squirrel Cage Blower
20— Single-Rod Gearshift Control
21—Non-Metallic Flexible Clutch Disc
22— Dual Reduction Drive
23—One-Piece Banjo Type Rear Axle
24— Full-Floating Construction
25— Rear Axle Accessibility
26— Drive Shaft Brake
27—Rubber (Shock Insulator) Shackles

Send for illustrated and descriptive literature on all exclusive Mack features listed above.

"In addition to being helically cut, the three gear train feature is unusual in that the camshaft and crankshaft *gears are both drop forged and case-hardened*, in a similar manner to the crankshaft, camshaft and other Mack engine case-hardened parts.

"By imparting to the teeth this *glass-hard* surface, the wear is not perceptible during the entire life of the engine."

MACK TRUCKS
OF CANADA, LTD.

Mack

28-30 Vanauley St., Toronto, Ontario

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- Hopkins & Co., Ltd., F. H.

Reinforcements, Concrete & Steel
- Burlington Steel Company
- Canada Iron & Wire Works
- Canadian Steel & Wire Co.
- Greening Wire Co., B.

Reinforcement Ties
- Bates Valve Bag Co.

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- Canadian Austin Machinery
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- McGovern, T. J.
- Mussens Limited
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- Sawyer-Massey Co.
- Waterous Engine Works Co.
- Watson Jack & Co.

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- Dom. Tar & Chemical Co., Ltd.

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Roofing Cement
- Barrett Company, Ltd.
- Dom. Tar & Chemical Co., Ltd.

Roofing Material
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- Canadian Johns-Manville Co.
- Dom. Tar & Chemical Co., Ltd.
- Imperial Oil Company, Ltd.
- Vitrified Clay Pipe Publicity Bureau

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- Queenston Quarries Co.

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- Brantford Sand & Gravel Co.
- Muldoon, Ltd., J.
- Paris Sand & Gravel Co.
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- Dom. Tar & Chemical Co., Ltd.

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- Canadian Equipment Co.
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- McGovern, T. J.
- Mussens Limited
- Osgood Company
- Thew Shovel Co.

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- McGregor & McIntyre
- Standard Steel Construction Co
- Waterous Engine Works Co.

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- F. H. Hopkins & Co., Ltd.
- Mussens Limited

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- Canadian Des Moines Steel Co.

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- Canadian Welding Works
- McGregor & McIntyre

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- Canadian Ingersoll Rand Co.
- McAvity & Sons, Ltd., T.

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- British Empire Steel Corporation
- Burlington Steel Company
- Hopkins, & Co. Ltd., F. H.
- MacKinnon Steel Company
- Nova Soctia Steel & Coal Co.
- Standard Steel Construction Co.

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- Hopkins, & Co. Ltd., F. H.
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- Hamilton Bridge Works Co.
- MacKinnon Steel Company
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- Hopkins, & Co. Ltd., F. H.

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- Heltzel Steel Form & Iron Co.

Steel Curb Forms
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- Horton Steel Works, Ltd.
- National Equipment Company

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- Canadian Des Moines Steel Co.
- Hamilton Bridge Works Co.
- Horton Steel Works, Ltd.
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- Can. Metal Window & Steel Products

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- Greening Wire Co., B.
- F. H. Hopkins & Co., Ltd.

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- Hagarty, R. E. W.
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- Horton Steel Works, Ltd.
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- MacKinnon Steel Company
- Reid & Brown Structural Steel & Iron Works
- Sarnia Bridge Company
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- Leckie Co., John

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- General Products Co.
- Italian Mosaic & Tile Co.

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- London Concrete Machry. Co.

Tile Drain
- Erie Clay Products Ltd.
- National Fireproofing Co.

Tile Hollow
- National Fireproofing Co.

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- Hamilton Bridge Works Co.
- Horton Steel Works, Ltd.
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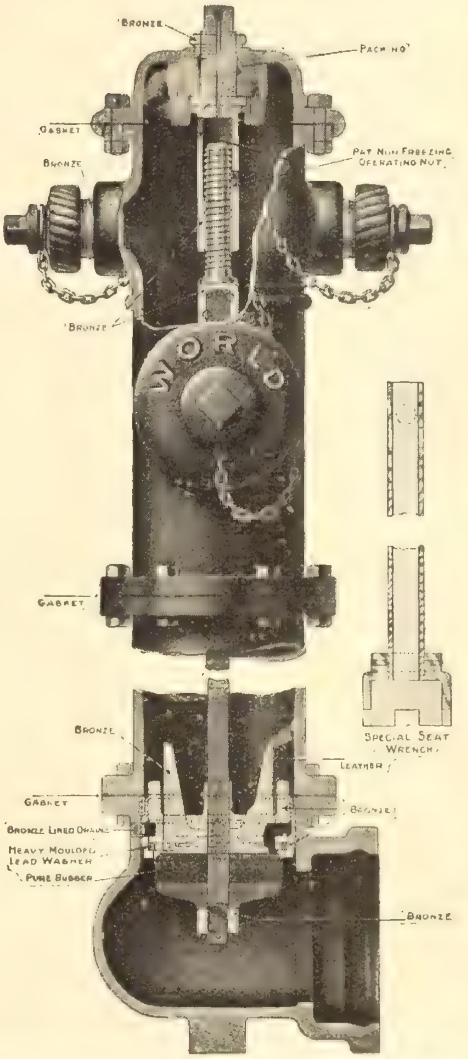
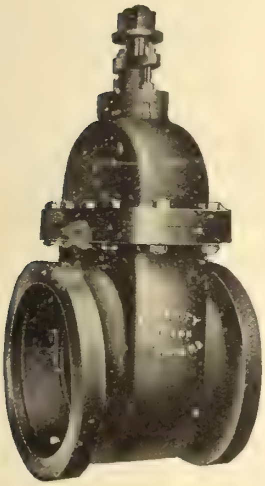
"McAvity" Fire Hydrants
and Gate Valves

"McAvity's" Hydrants and Valves have been the choice of engineers and municipal officials for nearly one hundred years. Today they are in service in every province in Canada and their numbers increase steadily.

Only products of exceptional merit could boast such a record.

"McAvity's" are "right"—in design, in materials, in workmanship. Make them your choice and you'll never have cause to regret it.





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The World's
Standard
Since 1834

TRADE WORLD MARK
McAVITY'S GUARANTEE
"Demand The Brand"

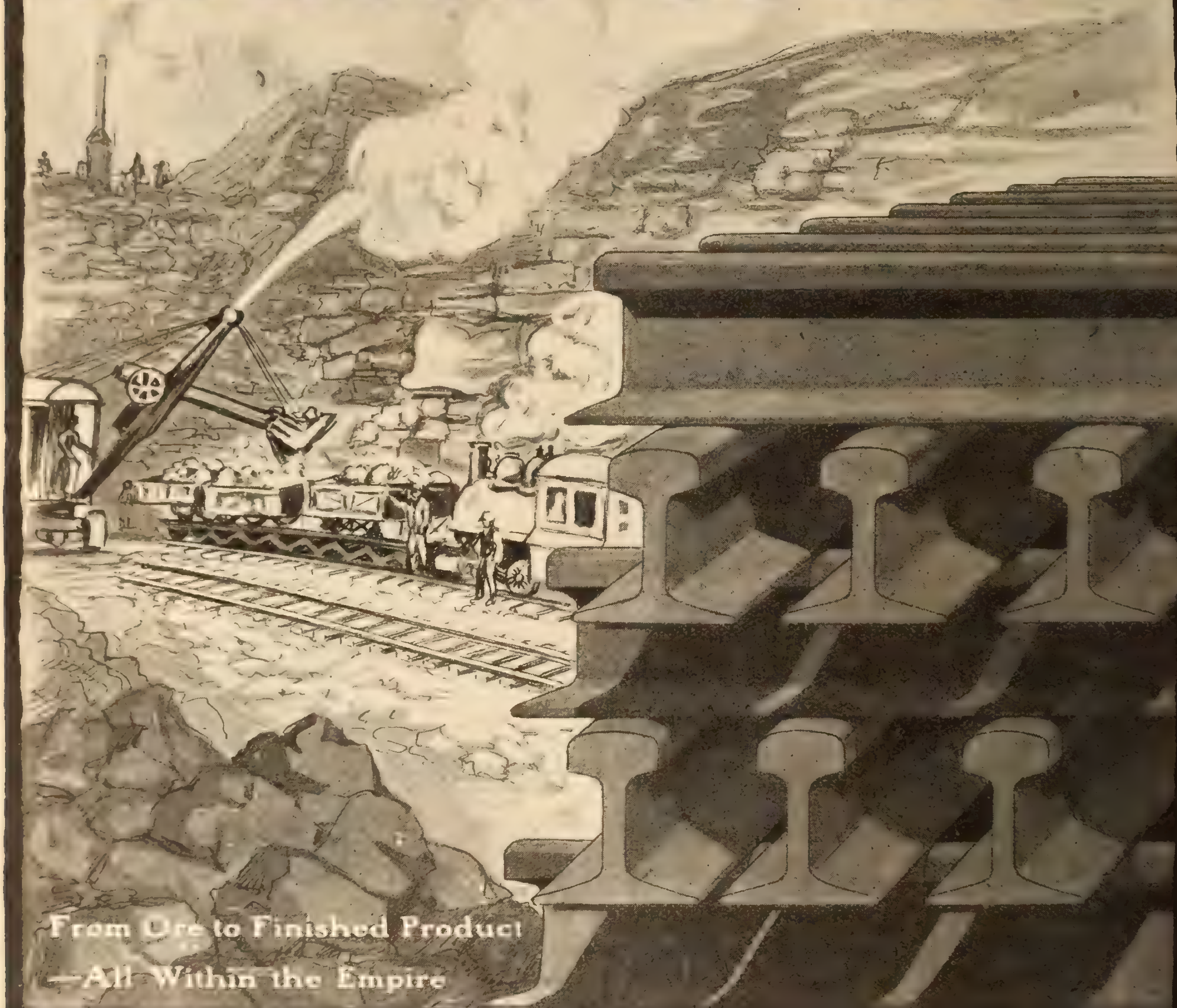
T. McAvity & Sons, Ltd.

Valves Fittings & Supplies

GOODS GUARANTEED GOOD BY ALMOST A CENTURY'S EXPERIENCE ESTD. 1834

St. John, N.B. Canada.

LIGHT RAILS


From Ore to Finished Product
—All Within the Empire

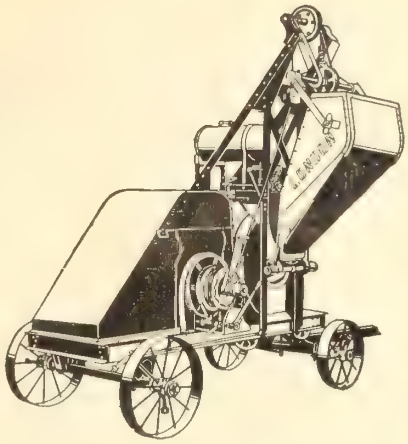
Light Rails for Mines, Construction Operations
and General Contractors' Use
(from 12 to 45 pounds per yard)

BRITISH EMPIRE STEEL
CORPORATION LIMITED
CANADA CEMENT BUILDING MONTREAL, CANADA

Western Representatives, Bissett & Webb, Limited Winnipeg

London Concrete Mixers

Equipped with Gasoline, Steam or Electric Drive
Power Loading Hopper, and
Automatic Water Tank



Prompt delivery on all sizes. A dependable machine built specially for Canadian conditions by a Canadian firm.

Information and prices gladly furnished on request.

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RAILWAY, MARINE AND CONTRACTORS SUPPLIES
EXCELSIOR LIFE BLDG., TORONTO ST.
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Representatives for:
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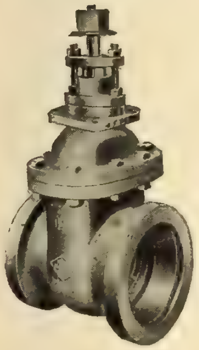

Fig. 400 F.M.

Regularly supplied to open by turning to the left. Can be furnished open to the right if desired.

This is Type "K" Jenkins Iron Body Standard Gate Valve

For Use With Indicator Post

Non-rising Spindle. **Hub Ends.**

Approved by the Fire Underwriters and, like all genuine Jenkins Valves, made to function satisfactorily under the strain of severe service.

You'll find this valve fully described in JENKINS Catalog No. 9—free on request.

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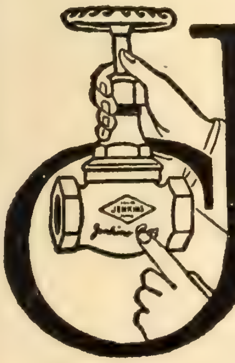
Sales Offices: Toronto — Vancouver
European Branch: 6 Great Queen St., Kingsway, London, W.C. 2, Eng.
Factories: Montreal, Bridgeport, Elizabeth



Always marked with the "Diamond"

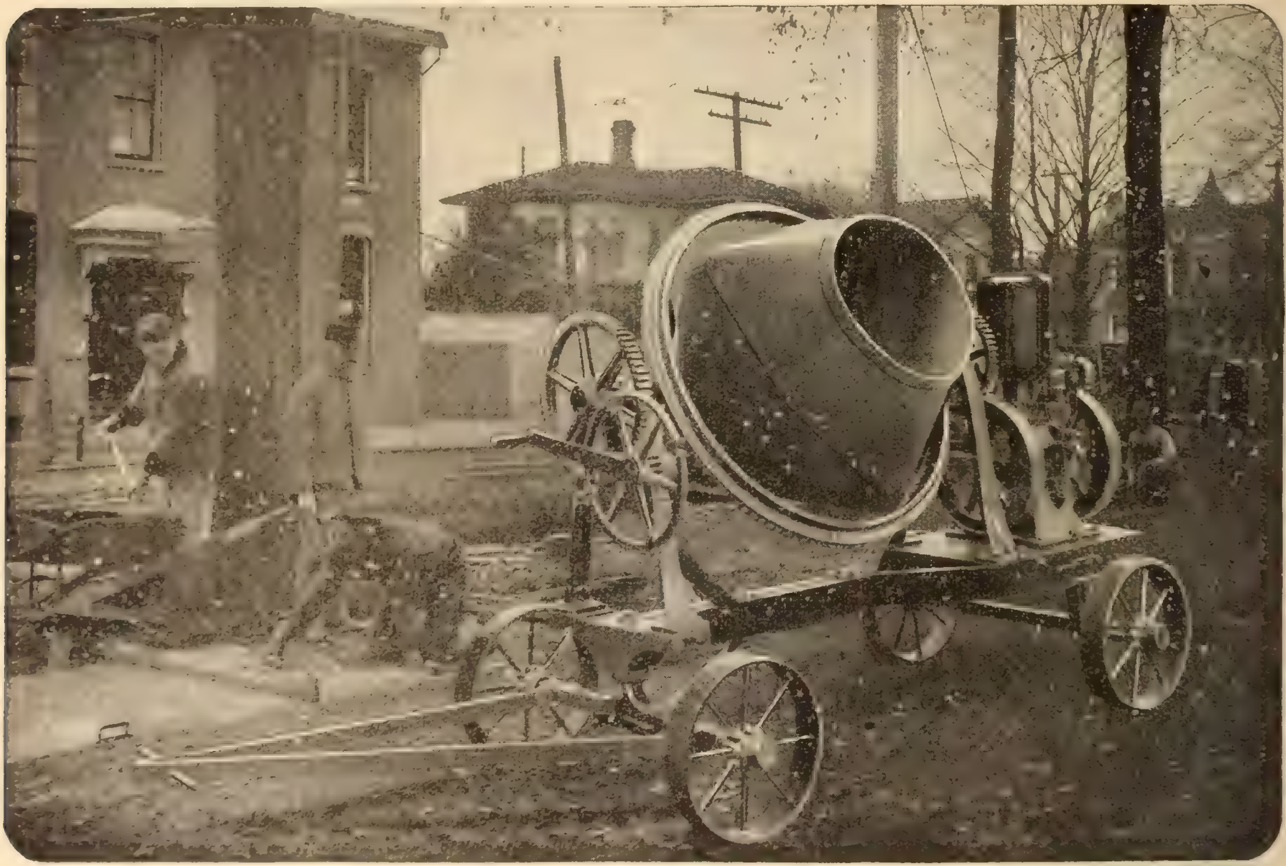
Jenkins Valves

SINCE 1864

AUSTIN
MACHINERY
"MOVES THE EARTH—MIXES THE CONCRETE"
TRADE MARK

The CUB-HEX

A LIGHT-TYPE PORTABLE CONCRETE MIXER



THE PROFITABLE MIXER FOR THE SMALL JOBS

Ordinary foundations, sidewalks, curbs, gutters, silos, tanks, culverts, floors and similar work not requiring the greater capacity of the larger size mixers can be more profitably handled by means of the "CUB HEX."

Its greater speed and the perfect mix, possible only with the famous Austin Cube principle, will save the contractor many dollars on the smaller jobs.

Its output of perfectly mixed concrete or mortar cannot be equalled by any other type of mixer, and it has honestly earned its reputation as the GREATEST UTILITY MIXER ever produced.

Illustration shows engine exposed, standard equipment is supplied with sheet metal housing entirely enclosing same.

Write us for descriptive literature, prices, etc.

CANADIAN AUSTIN MACHINERY LIMITED

WOODSTOCK, ONT.

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Man. and Sask.: J. L. Neilson, Co., Winnipeg.
Ontario: Dominion Industrial Products Co. Ltd., Toronto.
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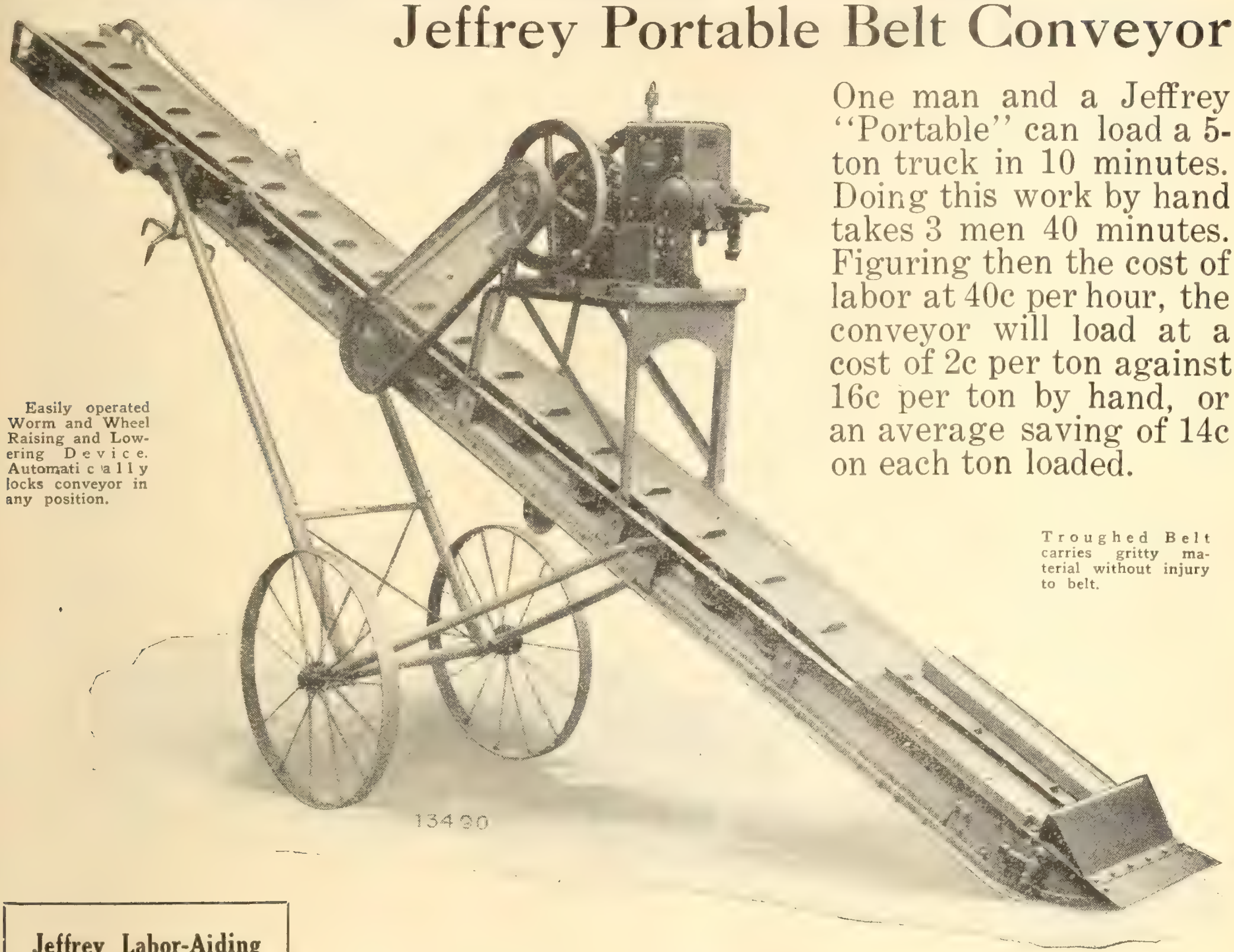
Save 14c Per Ton Loading With The Jeffrey Portable Belt Conveyor

One man and a Jeffrey "Portable" can load a 5-ton truck in 10 minutes. Doing this work by hand takes 3 men 40 minutes. Figuring then the cost of labor at 40c per hour, the conveyor will load at a cost of 2c per ton against 16c per ton by hand, or an average saving of 14c on each ton loaded.



Easily operated Worm and Wheel Raising and Lowering Device. Automatically locks conveyor in any position.

Troughed Belt carries gritty material without injury to belt.

Jeffrey Labor-Aiding Equipment Also Includes

- Portable Bucket Loaders
- Chains—Sprockets
- Bucket Elevators
- Conveyors—various types
- Coal and Ashes Handling Machinery
- Skip Hoists
- Industrial and Mine Locomotives
- Crushers and Pulverizers
- Coal Mining and Tipple Machinery

Other Important Features ☛

Light, rugged and inexpensive. Loads, reclaims or stores coal, coke, sand, gravel, crushed stone and similar materials.

Unloads cars—handles bricks, tile, small boxes and bags.

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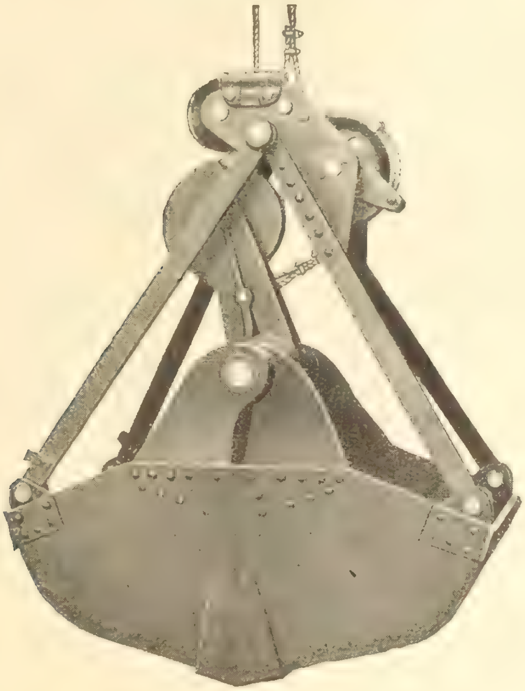

For handling coal, sand, gravel and bulk material of like character, on guy and stiff leg derricks, locomotive cranes, overhead cranes; in fact on any type of hoisting mechanism equipped for two line bucket work.

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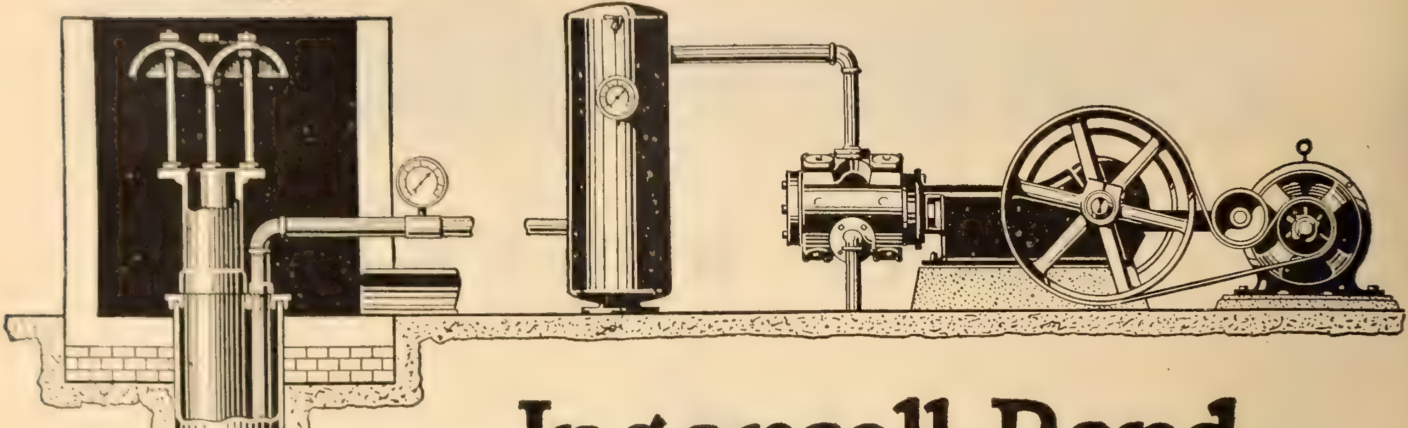

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Satisfactory performance, however, is largely dependent upon the experience of the manufacturer and the efficiency of the equipment used.

This Company's experience in Air Lift Pumping is coincident with the inception of this method of elevating well water and its reputation for the production of highly efficient air compressors—the heart of an Air Lift System—is unchallenged.

Interesting and informative bulletins sent to those interested on request

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The air lift equipment at the Mount Royal Hotel comprises an Ingersoll-Rand "Imperial" Class "VA" Air Lift Pump and a Class "ER-1" Straight-line Short Belt Motor-Driven Plate-Valved Air Compressors.

A Class "FR-1" Straight-line Steam-Driven Compressor is used for stand-by purposes.

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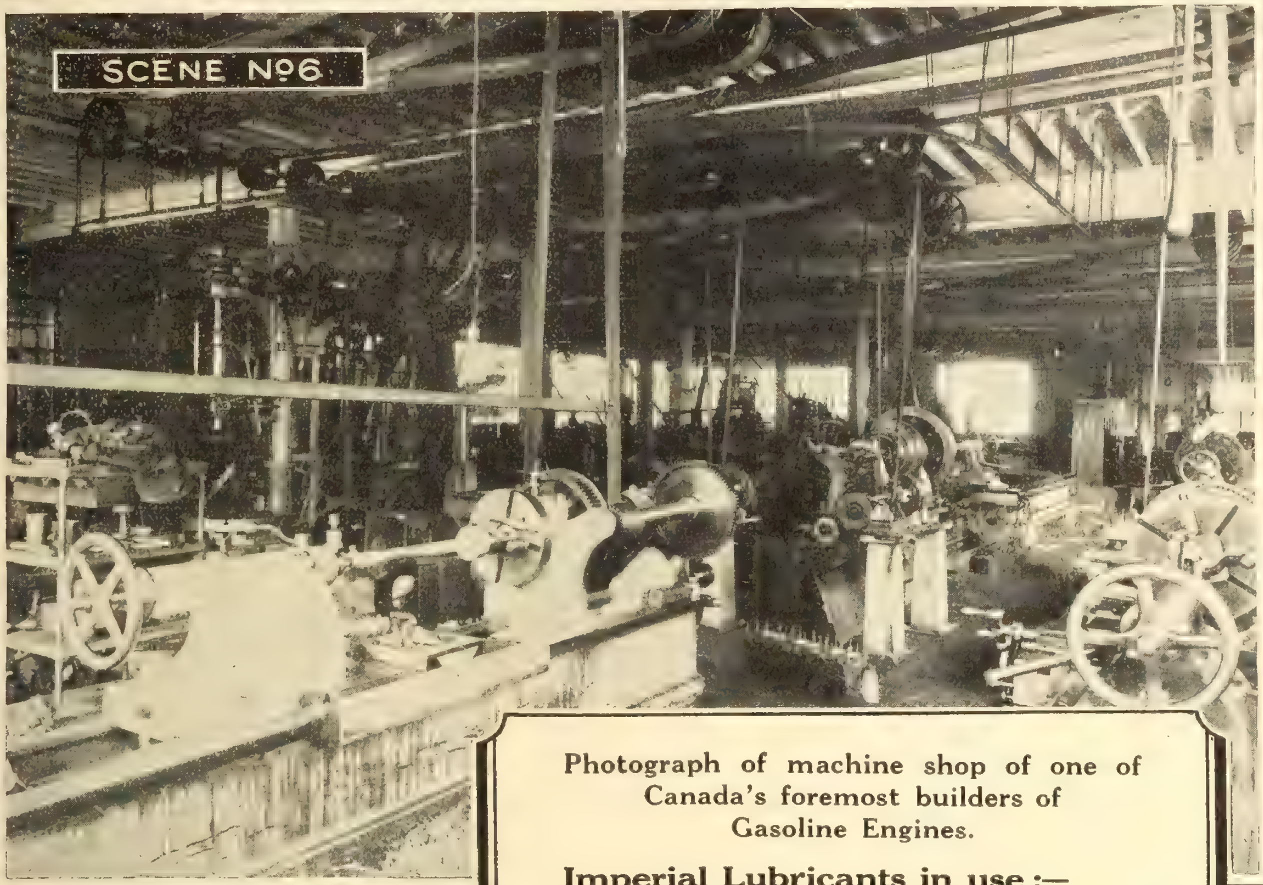

Photograph of machine shop of one of Canada's foremost builders of Gasoline Engines.

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Hundreds of Canadian firms have used Imperial Lubricants exclusively for years. The fact that we manufacture a grade of oil or grease for every lubricating requirement and always maintain the same standard of quality and service, makes it easy and profitable for you to standardize on Imperial Lubricants.

Write our nearest branch for the advice or service of an expert lubrication engineer.

IMPERIAL OIL LIMITED

The Adaptability of Concrete for Unusual Bridge Requirements

The LaSalle Bridge, Montreal, represents a type calling for all those qualities which Concrete possesses in marked degree.

It has to be a strong Bridge—to support the water-gates of the Canal which it spans.

It has to be durable—to give that permanence and freedom from upkeep, which the civic authorities naturally sought to make so important a feature of the Water Works improvements.

It was desirable that it should be decorative—to fit the modern conception of public utilities for a big city.

Having all these requirements in mind the engineers in charge selected reinforced Concrete for this important undertaking.

The result is a bridge that, besides fulfilling every practical requirement, has a distinct value to the neighborhood in which it is placed, from an artistic standpoint.

Many smaller and simpler bridges call for these same qualities—in still larger bridges the importance of selecting so durable and economical a material as Concrete are even more apparent.

Designed by F. G. Engholm, Toronto
Constructed by Fraser, Brace & Co., Limited, Montreal

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Uniformly Reliable

We maintain a Service Department to co-operate in all lines of work for which Concrete is adapted. Our library is comprehensive and is at your disposal at all times without charge.

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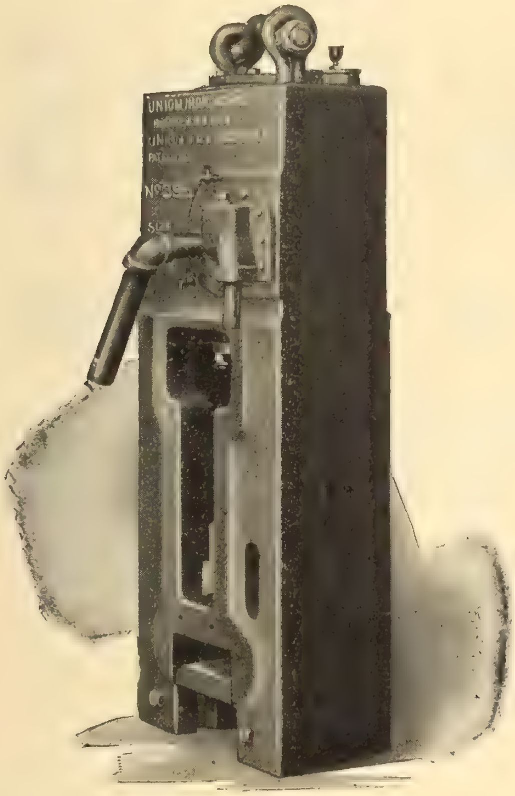

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For Steam or Air

DRIVES THE PILES AND
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"Union" Pile Driving Equipment,
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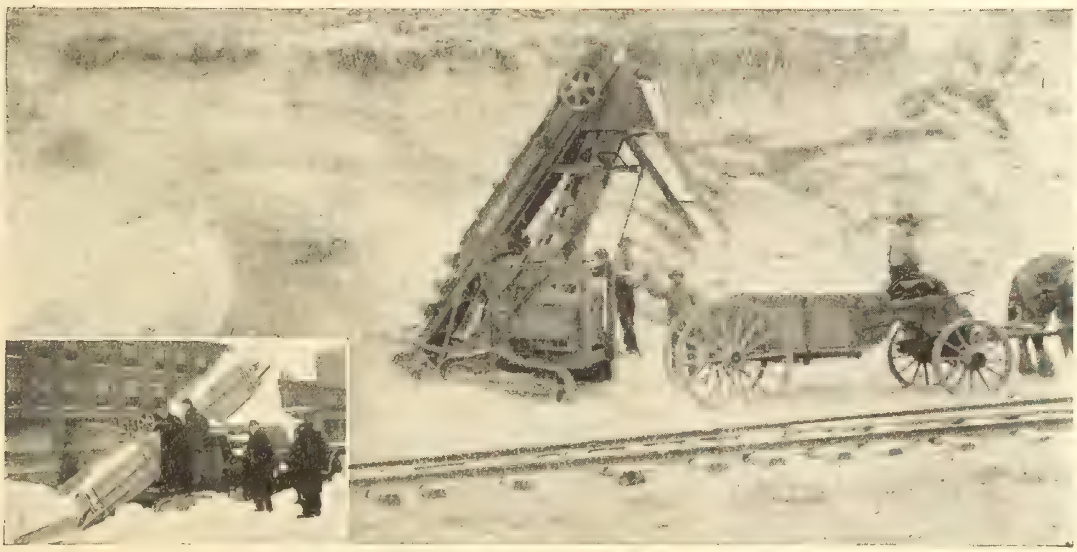


A Barber-Greene Snow Loader converted into a Bucket Loader and handling gravel

Gravel in Summer—Snow in Winter

How a Barber-Greene and 2 men replace a gravel-loading gang in summer — and 60 men in winter

IN Worcester, Mass., the street railway company decided to solve the snow removal problem with a Barber-Greene Snow Loader—just as many municipalities have solved it.

In this class of work the Barber-Greene saves 60 shovel men in some cities—and according to officials of the Boston "L" as many as 200 under certain conditions.

To put the Barber-Greene to work in summer also the Worcester company changed it into a Barber-Greene Bucket Loader—by replacing the snow-loading boom with the bucket-loading boom.

Like other street railway companies and many municipalities, they have found that in loading gravel for construction work the converted Barber-Greene replaces a gang with one man.

They have also found the Barber-Greene useful in other ways. For instance, when the track shown in the photograph reproduced above was too far away from the bank, the Barber-Greene was used to pull the entire track closer to the pit. No track gang at all was required to help the loader operator and his helper in this work.

The present high cost and scarcity of labor are influencing more and more municipalities to solve the winter snow and the summer construction problem at one stroke by putting a Barber-Greene to work.

Its automatic disc-shoveling device is so effective that it handles stone, gravel, and similar construction materials without even requiring shovelers for the clean-up work.

It is converted into a Snow Loader by replacing the bucket-loading boom with a snow-loading boom.

Its success is due to its design and to the fact that it is the product of a company that has for years specialized in material handling equipment.

Details about its construction performance are freely furnished upon request.

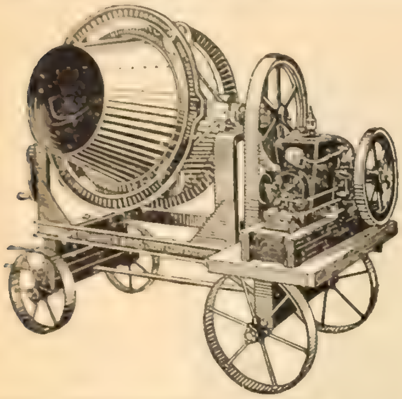
Ask our nearest office for particulars

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

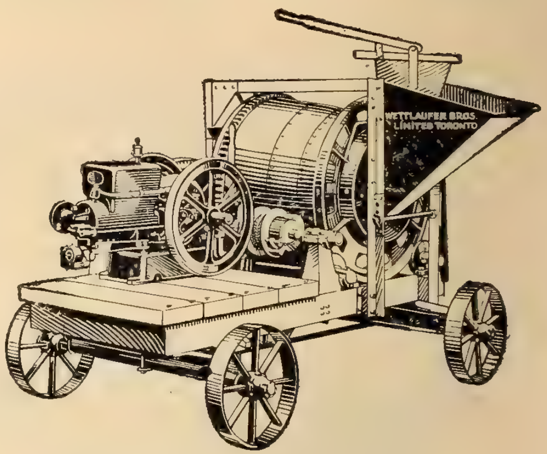
You'll Finish the Job Faster With Fewer Men if you get a WETTLAUFER Mixer

There is a type and size of Wettlaufer Mixer to suit the needs of every job and every contractor. Known all over the world for simplicity strength, speed and service.



THE WETTLAUFER O-POWER MIXER

is the mixer that makes small jobs pay. This 5 cub. ft. machine mixes mortar, plaster and concrete. Can be supplied with handy hoisting attachment. Three machines in one. An all-steel job—light, yet lasting. Every contractor needs one. Write for folder No. 151.



NOW REDUCED IN PRICE

Big demand from all over the world has made possible sweeping reduction in the price of our 6 cub. ft. stationary Drum mixer. You can now buy a Wettlaufer 1-B Mixer equipped with stationary batch bin or automatic loading hopper, with or without hoist, at a sensationally low price. Write for folder No. 210.

WETTLAUFER MIXERS

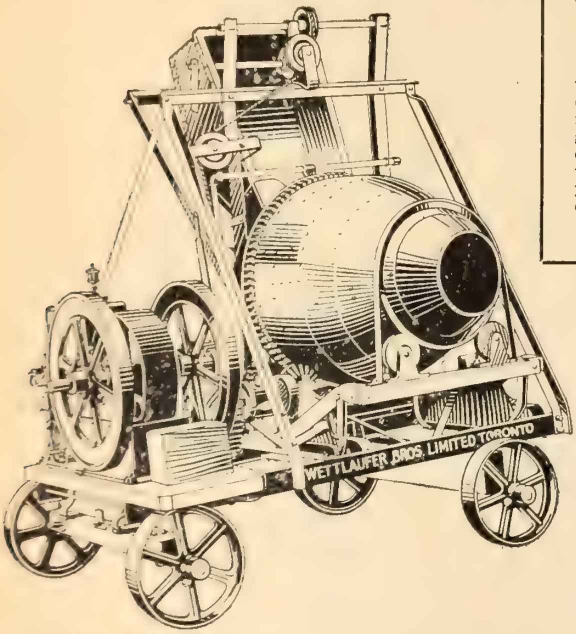
are equipped with

HEART-SHAPED DRUMS

which give better mixing, faster mixing, and quicker discharge and with

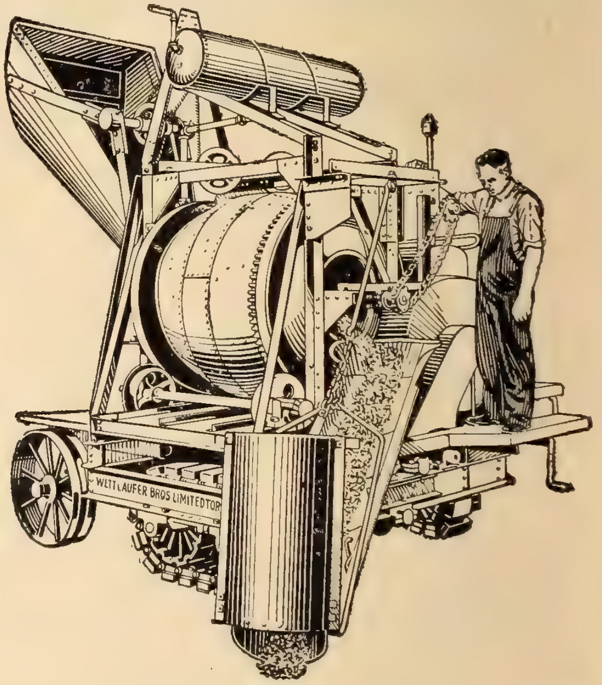
RING OILING SYSTEM

which keeps the machine thoroughly lubricated at all times, gives longer life greater freedom from trouble and enables you to run the machine with less power.



JUST THE MACHINE FOR BIG JOBS

Here is a 10 cub ft. Wettlaufer Tilting Drum Mixer that will make money for you on bridge work, paving jobs, heavy foundation work and any construction where you require large production at low cost. Empties itself clean. Write for folder No. 212, showing complete line of Wettlaufer Tilting Drum Mixers.



FOR ROAD JOBS

Here is the latest Wettlaufer success—a stationary Drum mixer equipped with caterpillar traction. One man standing in one position has complete control of this great mixer. This machine will pay for itself on road work in a few weeks.

WETTLAUFER BROS. LIMITED, 194 Spadina Ave., TORONTO

Sold by all branches of the Canadian Fairbanks-Morse Co., Limited

HOISTS
CRUSHERS
BLOCK
MACHINES

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AND CONTRACTORS' EQUIPMENT

**Write for
List of
SECOND
HAND
EQUIPMENT**

Judged by Its Bathroom

Not many years ago the bathroom of a home was a secondary importance. Today the prospective buyer's impression is considerably affected by the bathroom. In fact, the bathroom is often an outward indication of the true quality of the house itself.

A well-equipped bathroom leaves the feeling with a prospect that the construction of the house is also first-class.

The kitchen, too! Another point of great importance. Its main charm is a one-piece sink installed at the proper height.

"Standard" Plumbing Fixtures are designed and manufactured to give that satisfaction which the buyer of today is assiduously seeking.

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Use This Service—FREE

The "Contract Record" receives many letters from subscribers inquiring where certain building or engineering materials, supplies, equipment, machinery or apparatus can be obtained or disposed of.

In order to adequately and promptly serve our subscribers in this respect we have organized a special department to handle such requests for information.

This SUBSCRIBERS' INFORMATION SERVICE is at your disposal free of charge. Should you wish a certain machine or certain engineering or contracting equipment, supplies, etc.—ask us.

No inquiry is too small—we aim to make this service of practical and definite value to every reader of the "Contract Record." It is yours to use whenever occasion arises.

List below each item on which you want particulars, whether it be building or engineering materials, supplies, equipment or machinery. Mail to "Contract Record," 347 Adelaide St. West, Toronto.

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Use the Shovel that WORKS EVERY GOOD DAY

"From actual experience, our own and others, we know the Erie to be the most reliable shovel built, and lowest for upkeep cost—there is no comparison at all. The Erie can excavate more yards per hour or per day than any other shovel we have had."—**Chas. Rossow Constr. Co., Buffalo, N.Y. (Own 3 Eries.)**

Lost time is the bottomless pit into which more money than can be estimated has been dumped by contractors. A day free from delays will produce twice as much as an average day.

YOUR UP-TO-DATE CONTRACTOR keeps cost records that really tell him something! He knows just how much it costs him per hour when a machine breaks down and stops his work—how much it costs in lost labor, unproductive overhead, and loss of profits.

That's why you see the big majority of successful contractors using Eries. They know the dollars-and-cents value of equipment that is RELIABLE.

Up-to-date contractor wants service like this:

"One of our Eries has been grading continuously for seven months without losing as much as two hours' total time. The Erie is the best shovel we have ever used; it is the most reliable and has the lowest upkeep cost."—**Robert G. Lassiter & Company Norfolk, Va. (Owners of 6 Eries.)**

One letter like this means nothing; five or six letters like this do not mean very much. But when you read and hear HUNDREDS of such statements by contractors—all telling of this same kind of service from Erie Shovels and Cranes—then it is wise to profit by their expERIEnce!

Actual records prove that Eries have only 1-3 as much repair expense, AND MAKE A CORRESPONDING SAVING IN WORKING TIME.

We will be glad to show you hundreds of letters like those at the left—written by successful contractors who have had years of experience with different shovels and cranes. Also, we can ssnd you many carefully checked records of upkeep cost.

Keep your money out of the "lost-time" pit. Consider the facts, and you will be sure to "buy right." Drop us a line for the "Upkeep Cost Record Book."

These Contractors, and hundreds like them,

know better than to throw their money into the "lost-time" pit:

"I would advise any contractor who is in the market to buy an Erie—because it stands up. If we were to get another shovel it would be nothing but an Erie.

"We have had our Erie for nine months and have spent about ten dollars for repairs; most of our work is heavy grading and large cellars."—**Daniel Haupert Haupert & Lombardi, Brooklyn, N.Y.**

"The Erie cannot be compared to any other machine that I have seen or used. Before purchasing my Erie I owned another shovel which I was obliged to sell because of its extremely high upkeep cost.

"Grading roads and digging sewers with my Erie for a year and a half, my repair cost has been only $9.00."—C. A. Johnson, Virginia, Minn.

ERIE STEAM SHOVEL CO., ERIE PA., U. S. A.

Incorporated 1883: formerly BALL ENGINE CO.

Builders of ERIE Steam Shovels, Locomotive Cranes, Railway Ditchers

ERIE Revolving Shovels

ERIE Steam Shovel Co Erie Pa

The Largest Manufacturers of Concrete Pipe in Canada

DOMINION

CONCRETE PIPE

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As you want it **WHEN you want it**

REINFORCED

All sizes over 10″ reinforced with hard steel.

Stock carried in sizes up to 48″ diameter. Larger sizes made to order.

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Practically Indestructible

DOMINION CONCRETE COMPANY, LIMITED

Incorporated 1904

KEMPTVILLE — ONTARIO

Two 15,000 gal. Rivetted Tanks and one Three compartment truck tank supplied by us to The Pure Oil Co., Brantford

TANKS

For over thirty years we have been specializing in the fabricating of tanks (either welded or rivetted) and steel plate work of all kinds.

The accompanying illustration shows two of the many different styles of tanks we are manufacturing.

Our method of welding steel storage tanks is an absolute guarantee against leaking or breaking.

We build

Tanks (welded or rivetted), Steel Pipe, Elevators, Conveyors of all kinds, Steel Stacks, Steel Buckets, Dumping Skips, Screens, etc.

THE WATEROUS ENGINE WORKS CO. LTD., BRANTFORD, CAN.

ESTABLISHED 1886

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Better Times for the Dominion

"Business in Canada the past year and a half has pursued a course practically independent of the United States. On the whole domestic business has moved conservatively forward and there has been an entire absence of any tendency to 'boom' conditions. Taking into consideration the character of developments in the respective fields the assumption is warranted that in the future as in the immediate past Canada will be affected only indirectly by conditions which may prevail in the United States. Conditions in the Dominion are fundamentally sound and big developments may be expected over the next few years." Thus does the MacLean Building Review comment on the present situation.

Considering all affecting conditions it would seem quite logical that we may expect a period of long continued prosperity in the building industry by reason of a well maintained demand for new structures. It will take several years to catch up on the delayed building due to the war, and for sometime after that it will keep the building trades busy trying to keep step with the vigorous growth of the Dominion.

Building and labor costs have moved in a manner that may be regarded as moderately conservative, especially in view of the extended scale on which operations have been conducted in Ontario and Quebec, and the degree of inflation that has materialized in building circles in the United States. The peak price for building materials was reached in May, 1920, when costs were 184% above 1913. Deflation carried prices in May, 1922, to a point 78% above pre-war costs. An upturn was then experienced which reached 97% in May and subsequently reacted to 94% last month. While latter movements have been largely seasonal it is expected that the tendency will be toward gradually lower prices over a period of years.

Construction continues very active throughout Ontario and Quebec. British Columbia holds up well but conditions are quiet on the Prairies and in the Maritimes. Taking the country as a whole, contracts awarded during the first seven months of 1923 according to MacLean Building Reports, Limited, increased 23% and amounted to $196,165,700 compared with $159,146,200 during the same period of last year.

During July construction contracts awarded in Canada amounted to $30,842,500 compared with $26,694,200 a year ago. Residential building accounted for 30.5% of the July total, and amounted to $9,402,300. Business building amounted to $9,272,600 or 30.1%; industrial building, $1,514,500 or 4.9%; public works and utilities, $10,653,100, or 34.5%.

Official Report of Building Permits for June

Detailed returns were furnished by 49 cities, which issued over 1,500 permits for dwellings at a total valuation of approximately $7,600,000, and for some 3,600 other buildings estimated to cost nearly $5,800,000. Since the erection of several houses, apartments, stores, etc., is very frequently authorized by one permit, the number of buildings to be put up would be somewhat larger.

All provinces except Prince Edward Island, Nova Scotia and New Brunswick registered declines in the value of prospective building as compared with the preceding month. The increase in Nova Scotia of $70,543, or 91.8 per cent. was the largest, while of the declines recorded elsewhere that in Ontario of $3,136,195 or 28 per cent. was the most pronounced. Alberta, with a percentage decline of 40.4, however, showed the greatest proportional loss.

Only Quebec and Prince Edward Island recorded increases in the value of the permits issued as compared with June, 1922, there being percentage gains of 12.1 and 93.8 respectively in those provinces. Of the decreases indicated in the remaining districts, that of $1,176,166 or 12.7 per cent. in Ontario was the largest actual decline, while Nova Scotia, with a loss of $193,528 or 56.8 per cent., registered the greatest percentage reduction.

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Canada's Engineers—Fred C. Palmer

About a month ago Mr. Fred C. Palmer was appointed town engineer of Bowmanville, Ont., succeeding Mr. P. F. Newhouse, who resigned. Mr. Palmer is a man of considerable practical experience, having worked his way up from the ranks by dint of hard work and much study. While he was born in Longford, Ireland, he received his early training in England, having been apprenticed there to a mechanical engineer. He always preferred the open air to office or machine shop work and so in his early years in Canada he worked on construction jobs as a laborer. His mechanical ability and his knowledge of pumps, boilers, steam drills and other equipment, however, served him to good purpose and his employers were not slow to take advantage of his knowledge along this line. In this way he steadily advanced from one position to another.

For the past twelve years, Mr. Palmer has been in the service of the town of Oshawa. His first two or three years were spent in digging trenches, laying sewer pipes, building catch basins and manholes, and assisting to run a pumping plant which comprised one 150 horse power and one 100 horse power steam pump. For the last nine years he was sanitary and plumbing inspector of the town. Mr. Palmer is an associate of the Royal Sanitary Institute of London, England, and at present is president of the Association of Plumbing and Drainage Inspectors of Ontario.

Mr. F. C. Palmer

The Week's Developments in a Nutshell

The death of President Harding overshadowed all other events of the past week in the United States and to a certain extent regulated the movements in the stock markets and thus indirectly in the industrial world. It is doubtful if the effect will be extended, however, as the new president seems to have taken hold promptly and vigorously. Whether the change will have any effect on the tariff relations between Canada and the United States can scarcely be gauged at this distance. A movement that has been anticipated on this page for some time and is already much in evidence, is the return of mechanics to Canada from their temporary emigration to the United States in search of higher wages. This will tend to relieve the labor market and should enable us to carry on at full speed all through the autumn months.

The Western harvest will doubtless temporarily absorb a number of men who are inclined toward farming, but the effect will be small. Hard farm labor at three dollars a day is not an attraction to the average mechanic.

A valuable moral for Canadians as a nation is contained in the recent announcement regarding the estate of the late William Rockefeller, brother of the better known John D. This estate netted the tidy sum of sixty-seven million dollars made up, one would naturally expect, of Standard Oil Stock. Not so, however. The wily William had less than five per cent. of his wealth in his own company but more than two thirds of it in U. S. government and municipal bonds. If the small Canadian investor would follow a similar policy it would not only be a fine thing for the investor, but it would have a tremendous effect on stabilizing business and keeping the load factor of commerce along a straight line. Too much of our money is wasted in "oil" and too little on the development of legitimate commerce.

There are still no price changes in the material market that can have any effect on the cost of construction. Plaster of Paris alone has registered a drop; everything else is reported "no change."

The present market conditions in the iron and steel industry are very encouraging. Orders for this material are coming in much better than was expected early in July. During the first part of July business was very slow but towards the latter part of the month and the beginning of August it seemed to pick up with the result that the industry appears to be more or less stabilized for the rest of this year. Prices are good and those in the business are very optimistic concerning orders for the early part of the coming year.

The Way to Get Building Apprentices

D. Knickerbacker Boyd Tells How Craftsmanship in the Building Trades Should be Encouraged—An Address to the American Institute of Architects

At the many meetings which we have had of the Philadelphia Building Congress we have almost always come down to the one subject, that of the lack of apprentices, and the need of apprenticeship training in the building crafts. These conditions seem more accentuated today than ever before, because of the recent great increase in the amount of building construction. Notwithstanding this, the facts are that during the last 10 years the number of workers in the building trades has constantly decreased, while, with the exception of the period following the war, building itself has greatly increased, so that you see the situation we are confronted with today is quite a natural one. But it should have been recognized long ago.

Now, when we consider the problem of the apprentice in the building trades—or crafts, as I prefer to call them—and debate whether the fault lies with those who, it is often claimed, are endeavoring to restrict the number of apprentices or with the employers who it is also claimed are not willing to assume the responsibility of training young men, we have before us quite a large subject. And what we need, as architects, I firmly believe, is to devote more attention to craftsmen and not give all our thoughts to draftsmen, although we do need still to do much for the latter.

Boys Show no Interest

The difficulty seems to be, notwithstanding the two claims made, that the boys do not exist in sufficient numbers who want to learn the crafts and trades. The young men of today do not seem to want to enter what they consider the "laboring" field. So why go into protracted academic discussions as to who is responsible for the lack of numbers? We need to discover the cause of the lack of interest on the part of the boys.

We must inculcate the idea in the young men that the crafts do offer a future for them, and we must stimulate in their minds a desire to achieve something dignified and definite with their hands. The craving of every human being to create and accomplish can be satisfied through craftsmanship properly appreciated.

The present difficulty does not rest so much with the boys, it seems to me, as it does with many of their parents, and with most of the educational systems of the country. Traced back into the homes of the children, I really believe that the fault lies more with the mothers, sisters and sweethearts of the young men and boys, than it does with almost anyone else. These dear ladies, most of them, do not want to see their boys, brothers or "boy friends" dressed in overalls or the clothes of workingmen, and littered with mortar, plaster, sawdust, metal filings or paint. They do not seem to like that and they therefore use their persuasion on their relatives and friends to keep them from training for or engaging in this sort of work.

We, therefore, feel as we see it in Philadephia and as I have observed it throughout our movement elsewhere, that we can, as a group, accomplish definite results, and as individual architects, achieve something by directing our energies with equal force to the present journeymen problem, as well as to the apprentice.

No Encouragement from the Fathers

After all, the greatest discourager of the boy who might want to become an apprentice in the building trade can be, and most frequently has been in recent years, the father who is now working in the trades. Fathers or relatives who are employed in the so-called building trades at this time will generally not urge or encourage their sons or other young men to enter the same calling.

The journeyman of the present generation now working on the buildings we design realizes that he has lost much time in the sections of the country subject to cold climates, through seasonal losses of occupation. He has, in normal times, been subject to intermittency of employment and he has been working at what is almost always rated a hazardous occupation. He is frequently working out doors, subject to attendant disadvantages as well as advantages. His task is often a very heavy one and involves a difficult piece of work, and in spite of the skill required and art he many times displays, he tells his boy not to learn that trade. These men can be the greatest enemies of the building crafts today. I think the fault lies partly with the construction groups, the public and with us as individual architects.

Locally and nationally, studies of all the difficulties involved can be made and conditions alleviated through co-operation of all, including the public, by a sensible distribution of its new construction and maintenance requirements.

The Architect's Part

As for our part as individuals, if we architects recognize the fact that we are, as our very name implies, master craftsmen, it seems to me that we ought to be able each to accomplish our part in improving the status of other craftsmen by encouraging and giving recognition to the "workers on the job." It is these men who, as a matter of actual fact, assume their part with us in securing the results which we are striving for when we design our buildings and write our sometimes hazy specifications.

Many of us, if we look back through the years of our superintending, will perhaps realize all too suddenly that we have usually passed the worker by—that he has not been given sufficient recognition for services well performed. We all have to condemn work sometimes—but how much oftener, when it should be commended, do we do so? That, it seems to me, is one of the faults to which we can address ourselves, and we can very readily correct it if we will give heed to the human side of our own industrial relations. If our contact with the workers on our buildings is such that they know that real interest and good work will cause favorable comment, we will encourage them and help them to believe that which they may often be justified in doubting, namely, that what each is doing is, if well done, an accomplishment worthy, often, to be called an art.

The consciousness on the part of each that what he does is something vitally important to the success of the whole design and fabrication will cause each to feel that he must qualify as a craftsman, and not be content to consider himself merely one of a "gang" working on a "job."

I would like to give you one typical illustration of an actual experience in this direction:

Just before I left Philadelphia I attended the opening of an exposition there called the Palace of Progress. For this exposition there has been built under my direction one of the numerous buildings called the "model home." The management consented to issue a book descriptive of the materials used, with which we should all be more familiar than we are. It was also decided to list the name of every man who worked efficiently night or day to make that building a success.

Recognition of Workmen

In keeping the records to give this recognition to the craftsmen and workers, I asked some of the bricklayers what the names of the men were who worked with them in their particular craft. I said to them, "How about the mortar mixers and the hod carriers?" One of the bricklayers said, "My God! you don't want **their** names, do you?" I said, "Why certainly! You men must admit that you can't successfully perform your work, nor can the architect get the best results for the owner if you don't get good mortar and if you haven't got good strong shoulders to carry the mortar and bricks to you and place them efficiently for you. I consider those men very important to the rest of us."

The bricklayer said, "We only know them by their numbers, as 1, 2 and 3. That man over there is No. 2," (indicating). I had to go to the man and get his name personally, which I was glad to do, though it caused much astonishment on his part as to my purpose.

As a result of that talk and others, and of the fact that these men were going to be given recognition in the book, many of them who had been working day and night during two weeks said, "We will not accept any excess pay for the overtime or the night work, because our efforts to please the public are being recognized."

I have often talked to workers collectively and individually and asked them if they should be requested to express one wish that they would like to have gratified more than any other, what that wish would be. They have all said, strange as that may sound to some, that what they wanted most was some fair recognition for their work—or as they have put it—a few words of appreciation for work well done when they try to do their best.

In that direction we, as architects, can take advantage of many of the opportunities that our calling presents. We can surely appreciate the human factor and stop and talk with the men. They can work with us and not for us, and we can both learn and teach if we may, "Well done, old man," or Tom or Dick or Harry, or whoever he may be, if his methods and results appeal to us.

We may not always be in a position to say that they are doing their job well, for they know it a great deal better than we do, but we certainly can let them know at least that they are giving us the results that we have tried to provide for in our designs and that they are correctly interpreting what are sometimes, perhaps, vague specifications which could be much improved.

Restore Interest in the Craft

It seems to me, therefore, that the problem can be rightly solved and in part almost immediately solved if we can begin at once to improve our specifications, our methods and ourselves and by real human contact restore interest and pride of craft.

If we make the workers feel that we recognize their parts as real factors in the success of any enterprise, that their efforts and the results of their work form a large part of the success of our work, and the satisfaction of our client—if we do that, the apprenticeship problem will largely solve itself.

I would like to suggest, however, in view of the points raised on the apparent lack of apprentices, that some step might be agreed upon whereby the Industrial Relationship Committee could appoint a sub-committee on apprenticeship. In its title I would, however, include vocational guidance, because the fault, it seems to me, lies largely with the lack of guidance toward manual labor in the schools.

I believe that the Institute could do nothing of much greater value than to create such a committee if through it a new document might be prepared which could well be entitled "The Romance of Building," and be made available to the schools everywhere. In this booklet could be portrayed intelligently and enthusiastically, the advantages of being a worker on a building and of having an opportunity to co-operate with architects and all other craftsmen in being of ever increasing service to the people of this country.

Are Short and Odd Lengths of Lumber Desirable?

By **ADOLPH PFUND**
Secretary, National Lumber Dealers' Assn.

You have asked from me a brief report on the results of the questionnaire sent to the retailers with regard to that portion thereof which refers to the tentative suggestion of including both odd and short lengths in the standard grade specifications.

While questionnaires are still being received, and probably will be for another month, I may say that the vote thus far shows the retail lumber dealers in all parts of the country to be overwhelmingly opposed to the inclusion of short lengths and odd lengths in the standard grade specifications.

The vote indicates very definitely that the retail lumber dealers are strongly opposed to odd lengths, (except for 2 by 4 by 9 ft. lengths) being included in the standard grade specifications. They are opposed to this because: (a) the odd foot is wasted in selling, that is, the dealer gets paid for the next shorter even length; (b) studs, as customarily placed, make odd lengths impracticable; (c) odd length stock would greatly increase the necessary retail yard and shed capacity and, therefore, add to expense of doing business; (d) it is contended that the extra cost of doing business would more than offset advantages presumably gained as to conservation of timber supply; (e) it is also contended by some dealers that the high cost of freight makes it impossible to ship short lengths, whether odd or even, at such a price that will enable the dealer advantageously to handle them.

The vote on short lengths does not mean that the dealers are unwilling to help market a fair proportion of shorts. It means rather that dealers believe shorts should be marketed separately from present standard lengths, and at a price that will move them. It also means the dealers are very much opposed to the inclusion of odd lengths as short lengths. The comments show that dealers, generally speaking, believe that shorter stock than 8 ft. is impracticable for retail yard purposes, except a limited amount in uppers, and they are very emphatic that short flooring should be end matched.

It can all be summed up, as follows: Short and odd lengths should be sold separately from present standard lengths; they should be priced low and shipped only on specific order of the buyer.

The above gives you the trend of the questionnaires so far returned, and I may say that these replies are representative of dealers in every part of the country. This was a difficult matter to present to the lumber dealers because at present there are no definite proposals as to just what short lengths are meant, or what particular odd lengths, or what percentage it is proposed to include, and in which particular lumber items.

Activated Sludge System Reaching Perfection

Substantial Progress Being Made in the Direction of Decreasing the Cost of Compressed Air and of Satisfactorily Drying the Sludge—Mechanical Aeration Proves Successful

An excellent account of the development and principles of the activated sludge process of sewage treatment was contributed by Prof. Edward Bartow, of the State University of Iowa, to a symposium on sewage treatment at the Fourth Conference on Sewage Treatment at Iowa State College. After giving a brief history of the experiments at the Lawrence station and the development of this process in England and later in this country, Prof. Bartow continued as follows:

The features of the process which have delayed its development are the cost of compressed air and the satisfactory drying of the sludge. Attempts have been made to decrease the cost of the air by using an intermittent flow, by so arranging the bottom that the minimum amount of air required for stirring may be used, and by methods of mechanical aeration.

The intermittent use of air has been tried in England, but without great success. Activated Sludge Limited, the English company which claims ownership of the English and American patents on the process, have devised a scheme at Manchester, England, in which diffuser plates are placed along one side of a long tank in such a manner that circular currents are set up. The liquid is kept saturated with sufficient air to support bacterial life, and the current is great enough to keep the sludge in suspension and prevent putrefaction. A comparative test made on the waste from a starch factory at Argo, Illinois, indicates a saving of at least 25 per cent of air by this arrangement.

Haworth's Scheme of Mechanical Aeration

The most successful system of mechanical aeration has been devised by Haworth, superintendent of the sewage-disposal works of Sheffield, England. He first used a box in which was installed a cylindrical mechanism which revolved at the surface of the liquid, partially submerged. The liquid was kept agitated by the mechanism and sufficient air carried into the liquid to support the bacterial life. Haworth's next scheme was by the use of a vertical shaft around which paddles, revolving, keep the liquid in motion through a long series of tanks. This was followed by the construction of a plant intended to handle 1,000,000 gallons of sewage per day, consisting of a long series of tanks four feet wide and four feet deep, with paddle wheels at intervals to carry the sewage and sludge at a sufficient rate to keep the sludge in suspension. This plant has been in operation for nearly two years with satisfaction. It is claimed that it will operate at a cost of twenty horse-power per 1,000,000 gallons as compared with 35 horse-power for the other process stirred with air. With the approval of the British Board of Health, plans have been made for the construction at Sheffield of a plant of 15,000,000 imperial gallons capacity. The first unit of two and one-half million gallons capacity will be in operation by March, and will be installed on the site of the contact beds which have become inadequate for the disposal of Sheffield sewage. The process in use at Sheffield has been imitated by the engineers of the city of Paris, France, for an experimental plant of 1,500,000 gallons capacity. The French engineers gave careful consideration to all processes and have constructed the mechanical aeration of the Haworth type. When I saw the plant in August, 1922, it had been in operation about six weeks and was furnishing, without odor, a clear stable effluent, much to the delight of the French engineers. John Watson at Birmingham, England, after preliminary tests has determined to use the Haworth type of mechanical filtration. It is his plan to partially purify sewage by activated sludge, and to finish the process by passing the effluent from the activated-sludge plant to the sprinkling filter beds which have been in operation for many years.

Another scheme for mechanical aeration has been devised by Joshua Bolton, of Bury, England. Mr. Bolton has used settling tanks of the old Bury system. In the center of tanks about twenty-four feet in diameter he has built wells of sheet iron three and one-half feet in diameter, extending nearly to the bottom of the tank. At the upper part of these wells he has placed a flange extending from a few inches below the surface of the water to a few inches above. Vanes are fastened to a vertical shaft revolving in the flange and carry water from the surface of the tank and throw it in a spray over the surface of the water in the tank outside of the well. Near the circumference of the tank is suspended a baffle which prevents the spray from being thrown to the outside of the tank, directs the mixed sludge and sewage towards the bottom and allows the clarified affluent to flow up on the outside into the outlet trough. In one tank a sloping bottom carries the settling sludge under the central well. In another a slow-moving mechanism, consisting of radial arms with plows, carries the sludge beneath the central well. Preliminary tests with this mechanism have been so satisfactory that the British Board of Health has authorized the construction of a larger plant. It is claimed that the cost of operation may be reduced to fourteen horse-power per 1,000,000 gallons, compared with the twenty horse-power claimed for the Haworth process and the thirty-five estimated for the diffuser process.

In the United States large plants using the diffuser scheme have been constructed at Houston, Texas, and in Chicago, Illinois, at the Maywood plant, and are being constructed at Milwaukee, Wisconsin, and Indianapolis, Indiana, and have been authorized for Chicago, Illinois, north side. Smaller plants are in operation at various points. At Mason City, Iowa, a plant has been installed for the treatment of waste from a packing house. I designed the plant to take care of the waste when one thousand hogs per day were being slaughtered. The plant consists of rectangular tanks containing aerators and a circular tank with a Dorr clarifier to allow the sludge to settle and from which it can be returned to the aeration tank. When not overloaded this plant has operated successfully and the sludge has been dried and used in the by-products department.

No use has as yet been made in the United States of the mechanical principle. The mechanical device used at Sheffield would require much larger land areas than would be required for the diffuser process, and the cost of land might in some places prevent the use of the mechanical process.

The Sludge Problem

The second difficulty mentioned above, the dewatering and drying of the sludge, has been an object of investigation both in England and in the United States. Where the plants are running on an experimental basis at Manchester, the excess sludge is allowed to pass into the tanks or on to the drying beds used in the main process. At Worcester considerable land areas are covered with the sludge. Since the sludge contains from 98½ to 99½ per cent of moisture, and since it settles slowly and dries with difficulty, the disposal of sludge is a very serious problem. Centrifugal machines will reduce the moisture to approximately 90 per cent. The ordinary plate and frame filter-press will reduce the moisture to 79 or 82 per cent in the summer time. Experiments in the winter have often failed, unless the sludge has been warmed and treated with sulphuric acid or with alum. The best results have been obtained when the sludge has been warmed to a temperature of 150° F., and treated with sufficient acid or alum to cause the flocculent material to coagulate into larger masses. The best results obtained in America have been with an Oliver or American filter. These filters give a layer of sludge a little less than one-fourth inch thick, which will dry easily in the open air. The pressed cakes from a plate and frame press are one to one and one-half inches thick and when placed in the dryer are dried on the outside into an impervious layer which holds the remaining moisture. The rotary direct-heat dryers have been used for drying at Houston, Texas, without success. It is claimed that the experimental dryer at Milwaukee is satisfactory, and the Sanitary District of Chicago has installed a rotary dryer in its Maywood plant. The Maywood plant is about to operate and we will have some information concerning its operation in the near future.

An indirect-heat dryer manufactured by the Bayley Manufacturing Company has been used experimentally. The pressed cake used was too thick for satisfactory operation, and it is my belief that with the material obtained by the Oliver or American filter satisfactory results can be obtained with this apparatus.

Fertilizer Value

The dried sludge obtained in the activated-sludge process contains from four to eight per cent nitrogen. This sludge has been tested by the approved methods for analyzing nitrogen and has been shown to be valuable as a fertilizer. It has also been tested by Lipmann in California, who states that the nitrogen is of the same grade as tankage for fertilizing purposes. With Mohlman, and later with Hatfield, I have made pot cultures on wheat and garden cultures and vegetables, and have shown that the nitrogen is in a form available to support plant life. Calculations from the pot cultures of wheat show a yield of nine bushels per acre when no fertilizer is used, and thirty-six bushels per acre when pots were fertilized by activated sludge. These experiments have been repeated by Nasmith at Guelph, and our results corroborated. Russell and Richards, at the Tothamsted experiment station in England, have shown that the activated sludge is valuable as a fertilizer. I visited Sir John Russell during the past summer, and was told that he had no doubt of the fertilizing value of the sludge. The next step was for the engineers to find a satisfactory method for drying the sludge. He would then use it in large scale demonstration tests to show its value to the farmers of England. The workmen at the Sheffield sewage-disposal plant have used activated sludge in fertilizing their gardens. These workmen took all the prizes for which they could compete at the Manchester garden exposition. They took the district prizes and the general prizes, twenty-seven in all.

Usually it is necessary to place grit chambers and screens in the purification plant ahead of the activated-sludge plant. Screens of any kind can be used, but we have had some experience with the Dorrco screen at the experiment station at Urbana, Illinois. The sewage enters a tank in which a cylindrical screen revolves at such a rate that screened sewage on the inside of the screen is drawn above the level of the unscreened sewage outside and flows out through the screen, automatically cleaning the screen. Screens of this type have been successfully used in the screening of tannery waste.

It has also occurred to me that the effluent from the activated-sludge plants might be used to form fish ponds. Fish ponds have been in operation at Strassburg, France, for about ten years. The effluent from settling tanks mixed with two or three times its volume of river water will support fish life. The activated sludge effluent is so much better that it should be satisfactory without dilution.

Construction Developments During the Month of July

Figures Compiled by MacLean Building Reports, Ltd., Show Trend of Building Activities for Last Month—Details of Contracts Awarded in Eastern and Western Canada

Construction Contracts Awarded in Eastern Canada, July, 1923

	Ontario		Quebec		New Brunswick		Nova Scotia		Eastern Total	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	9	$ 217,000	....	$	.	$.		$	9	$ 217,000
Churches	9	171,200	3	135,000	1	8,000	.	.....	13	314,200
Factories	19	1,228,500	9	152,000			2	20,000	30	1,400,500
Garages, Public	6	111,000	3	86,000	1	7,000	...	.....	10	204,000
Hospitals	4	343,000	3	82,300	1	125,000	1	45,000	9	595,300
Hotels and Clubs	6	88,000	1	10,000	1	15,000	1	25,000	9	138,000
Office Buildings	13	485,900	6	419,000	1	1,500	.	.....	20	909,400
Public Buildings	6	75,600	2	234,400	2	61,000	1	115,000	11	486,000
Residences	941	4,585,500	321	2,722,300	15	78,500	19	74,000	1296	7,460,300
Schools	26	976,300	13	509,700			3	85,000	42	1,571,000
Stores	35	512,900	10	130,300	2	14,500	..	....	47	657,700
Theatres	1	10,000	..	....			1	15,000	2	25,000
Warehouses	4	364,000	2	2,518,000		...	3	23,000	9	2,905,000
Total Buildings	1079	$9,168,900	373	$6,999,000	24	$313,500	31	$402,000	507	$16,883,400
Bridges	23	427,700	3	10,500	1	12,000	....	.	27	450,200
Dams and Wharves	6	94,500	2	68,000			1	7,000	9	169,500
Sewers & Watermains	20	335,700	1	12,000	.			.....	21	347,700
Roads and Streets	85	2,844,700	78	2,032,800			6	110,000	169	4,987,500
General Engineering	34	2,565,000	14	582,000			2	91,900	50	3,238,900
Grand Total	1247	$15,436,500	471	$9,704,300	25	$325,500	40	$610,900	1783	$26,077,200

Construction Contracts Awarded in Western Canada, July, 1923

	British Columbia		Alberta		Saskatchewan		Manitoba		Western Total	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Apartments	3	$ 650,000	..	$	.	$	2	$27,000	5	$ 677,000
Churches	.	.....	1	6,900	2	5,500	1	10,000	4	22,400
Factories	2	108,000	1	6,000	.	....	...	....	3	114,000
Garages, Public	2	9,500	2	14,200	2	5,000	2	12,500	8	41,200
Hospitals	2	33,700	.	....	3	26,000	1	75,000	6	134,700
Hotels and Clubs			1	3,000	1	3,000	1	1,100	3	7,100
Office Buildings	3	215,000	...	....	1	1,400	....	....	4	216,400
Public Buildings	1	20,000	2	35,400	3	32,200	1	4,100	7	91,700
Residences	61	319,000	31	99,700	50	165,800	117	463,500	259	1,048,000
Schools	10	159,500	4	133,100	15	135,000	5	231,500	34	659,100
Stores	18	79,400	2	17,000	3	22,000	14	41,700	37	160,100
Warehouses	1	3,700	2	35,000	5	54,000	3	41,600	11	134,300
Total Buildings	103	$1,597,800	46	$350,300	85	$449,900	147	$908,000	381	$3,306,000
Bridges	1	4,000	.	. .	1	12,500	6	28,200	11	44,700
Sewers & Watermains	2	50,500	2	14,000	4	26,500	3	19,900	11	110,900
Roads and Streets	23	436,900	3	116,000	22	235,900	15	262,900	63	1,051,700
General Engineering	4	185,000	1	4,000	3	63,000		.....	8	252,000
Grand Total	133	$2,274,200	52	$484,300	118	$787,800	171	$1,219,000	474	$4,765,300

Construction of Wheelbarrows Standardized

Joint Committee on Construction Equipment Completes Report Recommending the Elimination of Unnecessary Varieties

A final report on the standardization of wheelbarrows, which will eliminate many unnecessary varieties and reduce the production of construction wheelbarrows to four classes, was submitted by wheelbarrow manufacturers to the Joint Committee on Construction Equipment at its meeting in Chicago on June 27, 1923.

The manufacturers recommended that until such time as the proposed standards are tied in with the American Engineering Standards Committee and made official American standards they be designated as the standard requirements or standards of the Associated General Contractors.

Under the proposed standards which have been approved by the Joint Committee and which now go to the Associated General Contractors for their approval, construction barrows are to be rated on the struck level volume of dry material and manufactured with specified gauges of metal as follows:

Capacity and Material

Class I—Struck capacity 2 cubic feet; to be manufactured of metal in gauges 15 to 18.

Class II—Struck capacity 2 1/2 cubic feet; to be manufactured of 15 or 16 gauge metal.

Class III—Struck capaccity 3 cubic feet; to be manufactured of 16 gauge metal.

Class IV—Struck level 3 1/2 cubic feet; to be manufactured of 16 gauge metal.

Classes I and II are of medium capacity intended for wheeling dry material. When in the wheeling position their capacities for wet material are reduced by one-third (1/3). When the material is heaped the capacities will be increased by one-third (1/3).

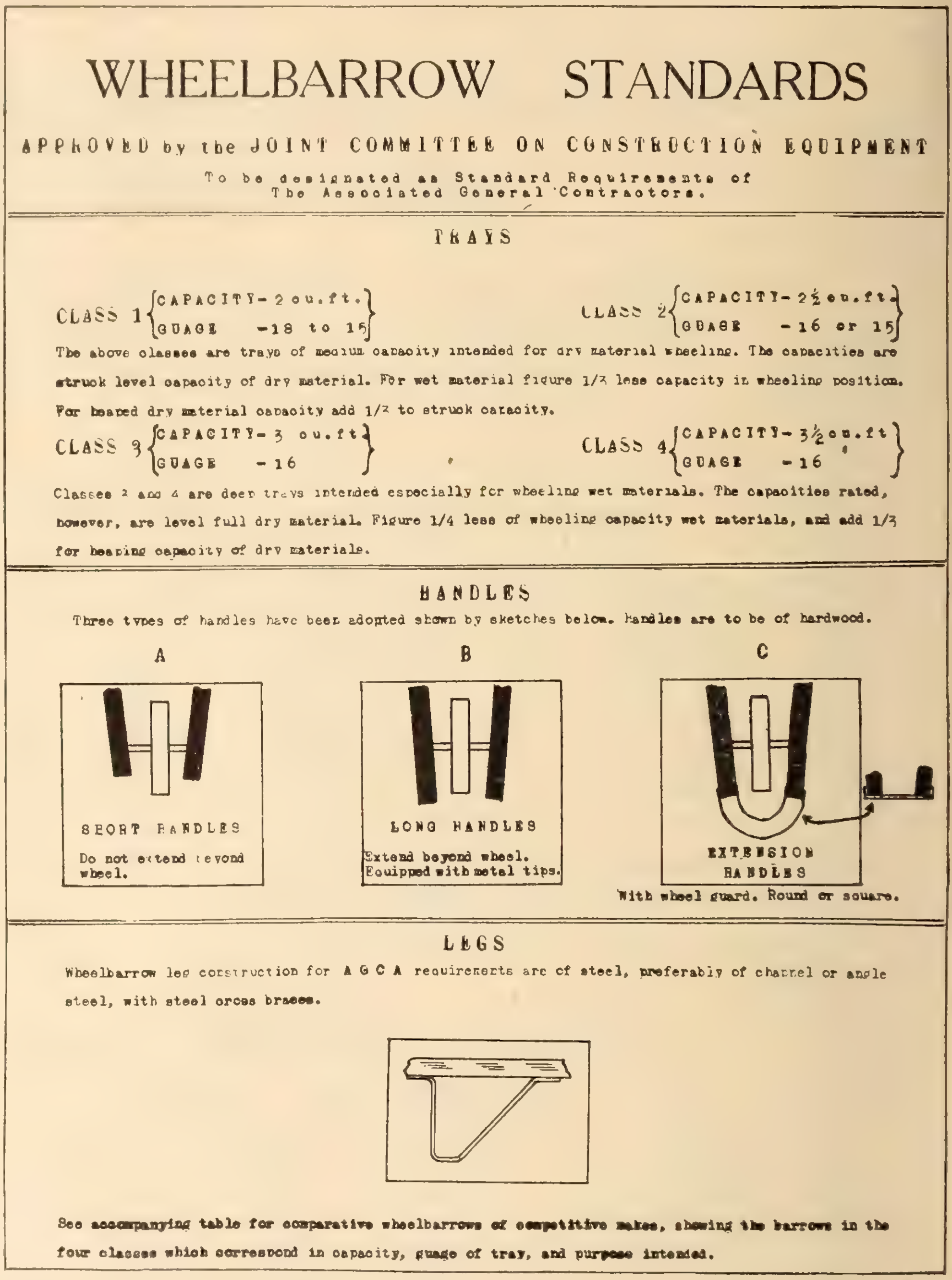
Classes III and IV have deep trays intended especially for wheeling wet material, though the rating is based on struck level capacity of dry materials. In the wheeling position the wet capacity is one-fourth (1/4) less than the level dry, while the heaped capacity is one-third (1/3) greater.

Three types of handles designated in the accompanying sketches are to be provided; first, the short handle with no extension beyond the wheel; second, the long handle with extension beyond the wheel but no wheel guards; and third, the extension handles with wheel guards.

Wheelbarrow leg construction is to be of steel and preferably of channel or angle steel with steel crossbraces. The accompanying table shows the manufacturers' number for wheelbarrows of the various companies that now conform with these standards.

Wheelbarrow Manufacturers Cooperate

The report of the wheelbarrow manufacturers



WHEELBARROW STANDARDS

APPROVED by the JOINT COMMITTEE ON CONSTRUCTION EQUIPMENT

To be designated as Standard Requirements of
The Associated General Contractors.

TRAYS

CLASS 1 {CAPACITY- 2 cu.ft. / GUAGE -18 to 15}

CLASS 2 {CAPACITY- 2½ cu.ft. / GUAGE -16 or 15}

The above classes are trays of medium capacity intended for dry material wheeling. The capacities are struck level capacity of dry material. For wet material figure 1/3 less capacity in wheeling position. For heaped dry material capacity add 1/3 to struck capacity.

CLASS 3 {CAPACITY- 3 cu.ft. / GUAGE - 16}

CLASS 4 {CAPACITY- 3½ cu.ft. / GUAGE - 16}

Classes 3 and 4 are deep trays intended especially for wheeling wet materials. The capacities rated, however, are level full dry material. Figure 1/4 less of wheeling capacity wet materials, and add 1/3 for heaping capacity of dry materials.

HANDLES

Three types of handles have been adopted shown by sketches below. Handles are to be of hardwood.

A

SHORT HANDLES

Do not extend beyond wheel.

B

LONG HANDLES

Extend beyond wheel.
Equipped with metal tips.

C

EXTENSION HANDLES

With wheel guard. Round or square.

LEGS

Wheelbarrow leg construction for A G C A requirements are of steel, preferably of channel or angle steel, with steel cross braces.

See accompanying table for comparative wheelbarrows of competitive makes, showing the barrows in the four classes which correspond in capacity, guage of tray, and purpose intended.

was presented to the Joint Committee by H. H. Baker, of the Sterling Wheelbarrow Company, who has been responsible for securing the co-operation of wheelbarrow manufacturers in this work. The investigation started shortly after the formation of the Joint Conference on Construction Equipment at Detroit last October, and a preliminary report was submitted to the Committee at its january meeting in Chicago. The group of manufacturers entering into the work does not as yet include one or two quantity producers and several companies who manufacture a limited number of barrows each year. These manufacturers, however, will be invited to join in the universal establishment of the standards.

Reduction in Number of Types of Mixers

Thorough Standardization of the Non-Tilting Machines is Recommended by a Joint Committee of Contractors and Manufacturers—Approved Provisions

Fourteen provisions for standardization of concrete mixers were approved by the Joint Committee on Construction Equipment in session with members of the Associated General Contractors and representatives of mixer manufacturers at a recent meeting of the Joint Committee. These provisions which cover some 30 specific points involved in the standardization of mixers, provide for a reduction in the number of types manufactured, cover the furnishing of auxiliary equipment, standard capacities and ratings and many other points of mutual interest to the manufacturer and the user of equipment.

The recommendations of the Joint Committee which now go to the Associated General Contractors for approval, deal only with the horizontal non-tilting drum type of mixer. It was recognized that the work of standardizing tilting mixers involved problems peculiar to these types which could only be determined after full consideration of the various points in conjunction with the manufacturers of tilting machines.

Upon recommendation of the manufacturers present at the meeting, it was agreed that the standards adopted should be designated as A. G. C. standards pending the establishment of contract with the American Engineering Standards Committee and the adoption of American standards. At the request of manufacturers also, the Joint Committee approved the use of a standard name plate to be later designed by manufacturers, giving the standard rating of the machine and its capacity for various proportions of mix, with a statement that the machine conforms with the standard A. G. C. requirements.

As a means of securing general adoption of the recommended standards, the manufacturers requested that the right to use the name plate be obtained from the Associated General Contractors and that the name plate be purchased through the Joint Committee on Construction Equipment from a company to be designated later. The report of the Joint Committee which received unanimous approval, is as follows:

Provisions Approved

Concerning the various items involved in the standardization of concrete mixers, the Joint Committee on Construction Equipment in session with the manufacturers of horizontal drum paving and building mixers has approved the following as standard for these types of mixers.

1. **Standard of Measurement:**
   (a) The standard of measurement of drum capacity shall be the cubic foot. It is recommended that water be used as the medium of measurement.
   (b) The standard for water tank measurement shall be the U. S. standard gallon.
   (c) The rating of boilers, steam engines and gas engines, shall be referred for advice to the American Society of Mechanical Engineers, and the rating of motors to the American Institute of Electrical Engineers.
2. **Method of Measuring Drum:**
   (a) The water level capacity of the drum standing still shall be used as the capacity of the drum.
   (b) The size of the mixer shall be designated by a number indicating the nominal rating of the nominal rating of the mixer according to its capacity in cubic feet of mixed concrete per batch.
3. **Rating of Drum:**
   (a) The water level capacity of the horizontal non-tilting type mixers with openings at both ends shall be between the maximum of 107 per cent. and the minimum of 102 per cent. of the nominal rating.
   (b) The water level capacity of the horizontal non-tilting type with openings at both ends but with discharge opening closed during mixing action, shall be 50 per cent. of the nominal capacity or rating.
   (c) The maximum operating grade to be considered in the rating of pavers is 5 per cent.
4. **Table of Aggregate Proportions:**
   A standard table of mixed aggregates from authoritative sources shall be adopted and published by the manufacturers. This table will give the quantities of mixed concrete for the various proportions of mix with certain percentages of voids in the aggregates and certain quantities of water. The standardization steering committee shall furnish the table.
5. **Standard Sizes of Mixers:**
   (a) There shall be three sizes of paving mixers manufactured, namely; the 7-E., the 12-E and the 21-E. Based upon 40 per cent. of voids in the sand and stone and a maximum of one gallon of water per cubic foot of mixed concrete, these sizes are to handle whole sack batches as follows:

	Number of sacks in batch		
Mix	7-E	12-E	21-E
1:1½:3	2	3	6
1:1½:3½	2	3	6
1:2:3	2	3	6
1:2:3½	1	3	5
1:2:4	1	3	5
1:2½:5	1	2	4
1:3:6	1	2	3

(b) There shall be four sizes of horizontal non-tilting type building mixers manufactured. Three of these shall be the 7-S, the 14-S, and the 28-S, and the fourth shall be subject to future action in conjunction with the manufacturers of tilting mixers.

Based upon 40 per cent. voids in the sand and stone and a maximum of 1 1/2 gallons of water per cubic foot of mixed concrete, the adopted sizes shall handle whole sack batches as follows:

	Number of sacks in batch		
Mix	7-S	14-S	28-S
1:2:4	1	3	6
1:3:6	1	2	4

It is recommended that a referendum be taken of the A. G. C. to determine whether the size 21-S is desired. If this size is desired, its capacity shall be a 4-sack batch of 1-2-4 mix and a 3-sack batch of 1-3-6 mix, based upon 40 per cent. voids in sand and stone and a maximum of 1 1/2 gallons of water per cubic foot of mixed concrete.

6. **Standard Table of Batches:**

A standard table of batches derived from the table provided for under item No. 4 shall be adopted and published by the manufacturers. This table will show the size of batch of various proportions for each standard size mixer. The standardization steering committee shall furnish the table.

7. **Method of Measuring Drum Speed:** (Double opening non-tilting drum only)

(a) The speed of the drum shall be measured in terms of the peripheral speed in feet per minute of the center of mass of the water level content of the drum when stationary. Both this speed and the r.p.m. of the drum shall be given by the manufacturer. Application of this provision shall be subject to recommendation and approval of a committee consisting of the chief engineers of the following mixer manufacturing companies: Austin Machinery Corporation; Chain Belt Company; Foot Concrete Machinery Company; Koehring Company; Lakewood Engineering Company; the Marsh-Capron Company; Ransome Concrete Machinery Company; the T. L. Smith Company.

It is recommended that state and municipal departments specify the peripheral speed of the drum as here defined instead of the r.p.m.

8. **Standardization of Mixer Equipment:**

Building Mixers

(a) Extension power loaders shall be eliminated.

(b) Mixers shall be equipped with tanks of sufficient size to deliver the indicated quantities of water per batch as follows: 7-S, 12 gallons; 14-S, 22 gallons; 21-S, 32 gallons; 28-S, 42 gallons; 7-E, 12 gallons; 12-E, 22 gallons; 21-E, 32 gallons.

Tanks shall withstand a working pressure of 150 pounds per square inch. One tank shall be standard.

Water supply connections shall be furnished as follows: 7-S, three-quarter inch garden hose nipple; 14-S, one and one-quarter inch standard iron pipe connection; 28-S, two-inch standard iron pipe connection; 7-E, one and one-quarter inch; and 12-E and 21-E, two-inch standard iron pipe connection.

(c) Discharge control on one side only shall be standard but may be furnished on both sides as an extra.

(d) Skips shall be made with closed ends.

(e) Standardization of wheels shall be referred to the mixer association for further investigation and report.

(f) Power discharge shall be eliminated as standard but the manufacturers may furnish same on 28-S and 56-S mixers as an extra.

Paving Mixers

(a) Only full caterpillar tread or four wheels shall be used on 12-E and 21-E machines, and four wheels only on 7-E machines.

(b) Maximum width of skip four feet from end shall be 100 inches.

(c) Power steering control shall be used in full caterpillar and hand steering on four-wheel machines.

(d) Hand power boom swing only shall be used.

(e) Maximum speed of travel of mixer shall be 1 1/2 miles per hour and minimum 1/2 mile per hour.

(f) The batch transfer derrick shall have a reach of 14 feet from center line of machine as standard.

(g) Engine tools only shall be furnished on the 7-S mixer. On the 14-S, the 21-S, the 28-S, and on all paving mixers, the manufacturer shall furnish all necessary special tools and a kit of standard tools to be agreed upon by the manufacturers' committee.

(h) An auxiliary hoisting drum may be furnished only on the 7-S, as special equipment.

9. **Shafts and Gearing:**

The sizes of shafts, keys, keyways, gears, and the composition of gears shall be referred to the American Society of Mechanical Engineers for recommendation as to procedure in standardization.

10. **Standardization of Power:**

The question of standardization of power with reference to requirements for different machines shall be referred to the A. S. M. E. for advice as to proper procedure.

11. **Safety Devices:**

All working parts shall be guarded. Paving mixers shall be provided with safety devices to protect men when the skip is being lowered.

12. **Standardization of Names of Parts:**

The nomenclature of the Concrete Mixer Association, with additions recommended by the manufacturers' committee above named, to bring this nomenclature up to date, shall be adopted as standard.

13. **Name Plate:**

A name plate giving the standard rating of the machine, its capacity for different proportions of mix and such other data as may be later determined, shall be affixed to each machine.

A committee of three manufacturers shall pass upon the plate and manufacturers shall obtain the right to use this plate from the A. G. C.

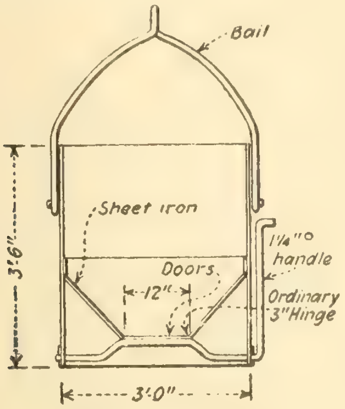
14. **Principles of Lubrication, Bearings and Anti-Rust Paint:**

The manufacturers shall fully, effectively and honestly set forth in their printed matter, information on the principles of lubrication, care and composition of bearings and material and the use of anti-rust paint as used in their machines.

Hints for the Contractor

Home-Made Concrete Bucket

A home-made controllable bottom-dump concrete bucket is shown in the accompanying sketch, taken from "Engineering News-Record." It consists of an ordinary 3-ft. diam. dirt bucket from which the bottom has been cut and a new one, made of two doors and sloping sides installed. Doors are 6 in. x 24 in. of 3/16-in. sheet iron, and hinged (with three hinges each) to the sloping sides, leaving an opening 12 in. x 24 in. They are kept at a sufficient distance from the bottom so as to swing wide open, and still not be damaged, when the bucket is set down. The sloping sides, also of sheet iron, are drawn in from the circumference of the old bucket to the 12 in. x 24 in. door opening so that the contents of the bucket will flow out easily.



Section through Center

CONCRETE BUCKET MADE OF 3-FT. DIRT BUCKET

A 1¼-in. diam. round iron handle bends and runs under the bottom of the bucket to form the latch, the operation of which is clearly shown in the sketch. By controlling the handle the doors may be opened to the desired width.

Blasting to Loosen Up Material for Suction Dredging

Dynamite was effectively used recently, according to "Engineering and Contracting," at the city of Kissimmee, Fla., where a dredge had been engaged to pump material from the bed of Lake Tohopekaliga to fill in back of a bulkhead, and make ground which it is intended to use for park purposes. The ground in back of the bulkhead was a marsh of some 7 or 8 acres which had to be raised from 1 to 5 ft., according to grade, with material pumped from the lake. The bottom of the lake consisted of heavy clay and marl, and was so stiff that unsatisfactory progress was being made until Otho O'B. Strayer, a dynamite expert of the duPont Company, was consulted, and he advised breaking the hardpan with dynamite and thus making it easy to get at the lower strata in the lake bottom. Under Mr. Strayer's directions, two rows of holes—20 holes in all—the rows 6 ft. apart and the holes spaced 10 ft. apart, were put down and loaded with 2 1/2 lb. of 50 per cent. straight dynamite each. The holes were put in from a pontoon and a 4 in. casing was used as a guide for hose nozzle and for loading purposes. The work had to be done through water from 2 to 4 ft. deep. The blast was a complete success, and reports show that after the use of the explosive, the dredge pumped out more material in the same length of time than it had ever handled prior to blasting and with half as much power.

Handling 36-in. Cast-Iron Water Pipe

In handling 2,200 tons of 36-in. Class D water pipe for replacement at the feed main for the City of Schenectady, N. Y., the following method, explained in "Engineering News-Record" was used:

At the railroad siding, pipe was loaded from cars to a motor truck by means of a standard railroad yard crane and a pair of pipe hooks. The rigging on the truck was a pneumatic dump body with sides removed and three 2-in, planks bolted crossways on the truck platform, one at each end and one in the middle. To these planks were bolted two 8 x 8-in. timbers spaced far enough on either side of the center of the truck so that when the 36-in. pipe was lowered between them it was kept from rocking.

With the pipe in place on the truck, a binder chain was thrown over the pipe from the one side of the frame to the other and made tight with an elm binder. In loading pipe on the truck, the bell end was always placed toward the back so that it hung over the truck end.

With the truck backed into position at delivery points the hoist was operated until the pipe would slide. When the bell touched the ground, the truck body was chained so that there would be no back lash as the pipe left the back of the platform. A 10 x 10-in. timber was placed behind the truck so that as the pipe dropped the timber would catch the pipe about 3 ft. from the spigot end. By the time the pipe left the end of the platform, there was only a drop of a few inches to the timber.

With a 3 1/2-mile haul each way, one truck driver with three helpers unloaded as high as 15 sections a day by this method and not a single pipe was damaged in handling the entire 2,200 tons.

Albert Mfg. Co. Have Recovered from Fire

The Albert Manufacturing Co., Hillsborough, N. B., announce that they have recovered from the blow administered on the 16th of March last, through the total destruction of their milling and manufacturing plant by fire. They now have a well-equipped plaster manufacturing plant of largely increased capacity, and expect (after the preliminary delays which almost always occur in connection with the starting of a new plant) to be in a position to fill all orders promptly, and with a grade of plaster which can not be excelled on the continent.

Do You Get Service from Your Steam Rollers?

Do You Keep Them Properly Maintained and in Good Running Order?—Important Points not to be Overlooked if Road Rolling Machinery is to Give Proper Results

Present conditions demand that every possible economy shall be effected in running and maintenance expenses of steam rollers and similar self-moving plant. The object of these notes, taken from a paper presented by Major G. W. G. Allen at a meeting of the Institution of Municipal and County Engineers (British), is to suggest the direction in which some economies may be effected. Reference is made in particular to steam rollers, but a number of these suggestions apply equally to steam tractors, wagons and similar engines.

It lies within the power of the driver to vary the running cost considerably. The most economical method of firing, with a boiler that steams reasonably well, is to have a thick fire, care being taken that the firebars are always evenly covered. Holes in the fire allow air to pass, causing variation in temperature, and are a frequent source of tube and stay leakages. Only in cases where a boiler steams badly should a thin fire be permitted. Apart from the saving in fuel, a thick fire stresses the firebox plates less, as the heat is more evenly distributed.

Coal

It is false economy to use poor coal. A good steam coal is cheaper in the long run. Buckled firebars should be renewed at once. Apart from the wastage due to large coal falling through the ashpan will soon be deteriorated through excessive heat.

Boiler tubes should be frequently swept. Ashes should not be allowed to accumulate in the bottom of the smoke box. When the engine is not being used the fire box and smoke box should be carefully cleaned out, otherwise wastage of the tube plate and smoke-box bottom will take place.

The boiler should be washed out frequently, at least once in every 100 hours' working; this will prevent scale forming, avoid the risk of fire-box plates being burnt, and the valve and cylinder faces being cut as a result of priming.

The injector and pipes should be frequently cleaned out. Scale can be removed from the injector by soaking in dilute spirits of salts. Particular attention should be paid to keeping the injector steam-cock and boiler clack-box tight; most injector troubles can be traced to leakage at these points, causing furring up in the injector.

Waterlift

Leakages at the steam-cock of the waterlift may cause heating of the water in the tank, and render the injector difficult to operate.

When the roller is out of use for a considerable period coal should be removed from the tender, as, if allowed to get damp, it sets up rust, and rapidly deteriorates the sides and floor of the coal bunker.

Pump

The passage between the pump body and the boiler should be kept clear. This soon becomes furred up, and the hole reduced in area, causing an excessive strain on the pump.

Water-Gauge Fittings

The average type of water-gauge fitting is difficult to keep in order. If neglected, the water level shown may be unreliable, and trouble caused owing to shortage of, or excessive, water. The most satisfactory water-gauge is the needle-pointed type, with cone seat and packed gland, which remains tight indefinitely, and has the advantage of being easy to operate in the event of the glass breaking.

Lubrication

It is false economy to buy low-grade oil. Little and often should be the maxim for the driver. Make sure that the oil actually reaches the bearing. Oil pipes often get blocked up with thick oil. Particular attention should be paid to the inner bearings of front rollers; they are somewhat inacessible, and, owing to the camber of the road, take the majority of the load on the front of the roller. The hind-axle bearings are very heavily loaded and slow moving. If oil fails to reach them very considerable damage may be caused before the trouble is discovered. The old-type displacement cylinder lubricator is unreliable, generally allowing its charge of oil to run direct into the cylinder instead of feeding the oil in gradually. A mechanically-operated oil pump will effect a saving in the quantity of oil used, and increase the life and efficiency of the slide valve and piston.

Boiler

Boiler tubes should be removed periodically, thoroughly scaled, and the inside of the boiler cleaned out, the tubes annealed and replaced. Apart from economy during running time, if this is done the engine will steam more quickly when getting steam up. When the tubes are out the throat plate and flanged front-casing plate should be examined for grooving, which occurs in some cases.

Exhaust Pipe.

One of the most prolific causes of fire box and tube trouble is a furred-up exhaust pipe. The hydrocarbon cylinder oils now used pass through the cylinder with the exhaust steam, and the interior of the exhaust pipe becomes sticky with oil. When the engine is reversed, while still in motion, a puff of smoke and ash dust is drawn into the exhaust pipe; this adheres to the oily skin in the pipe, and gradually contracts the internal area. It is not uncommon to find the bore of the pipe reduced to 1 in. diameter. This throttles the exhaust, causes back-pressure on the piston, loss of power, uses more steam, and puts additional blast on the fire, thereby using more fuel and water. Exhaust pipes should be frequently removed and cleaned.

Link Motion

It is seldom realised what a great effect slight wear in the link motion will have on the travel of the valve. The average link motion and reversing gear on a single-cylinder engine has six pins. Quite a small amount of play on these pins may reduce the lead of the valve by 1/16 in. or more, and if the lead of the valve is reduced there is no cushion to stop the piston and other reciprocating parts at the end of the stroke, and the cut-off is correspondingly later, giving less expansion and a higher terminal exhaust pressure, which means less power developed and higher consumption of coal and water. With modern hardening and grinding appliances, the repair of link motion is not a serious matter, and renders complete renewal of these parts unnecessary. Although an engine will run with its link motion badly worn, the loss of economy is more serious than is generally realised. Most valve-spindle breakages are due to worn link motion.

Lagging

The lagging should be removed periodically, and the boiler barrel thoroughly cleaned down, painted with non-corrosive paint, and fresh lagging fitted. Apart from conserving the heat, this will give an opportunity for inspection of the boiler plates, discovery of leaks, pitting and prevention of corrosion. Material damage often occurs to boilers through neglect. It is surprising how quickly local wasting will occur in the neighbourhood of slight leaks if the latter are not attended to.

Roller Wheels

One of the most serious expenses of roller maintenance is the wheels, and likewise the greatest economy can be effected in their upkeep. If the rims are not worn too thin, say, not less than 1¼ in. for hinds and 1 in. for fronts, they can be plated with wrought steel plates, when they will wear approximately three to four times longer than new cast-iron wheels, and furthermore, they can be subsequently replated. The camber of roads is different in various districts. Generally, in the case of cast-iron wheels, no provision is made for the wheels to fit the camber of the roads in the district where the roller is working. The initial wear of cast-iron wheels while they are adapting themselves to the camber of the road is rapid. When wheels are plated the camber of the worn cast-iron wheel is retained, and consequently plated wheels have a full bearing on the road from the start.

Materials for Rims

The great difference in the life of cast-iron and steel is due to the following reason:—On coming in contact with a sharp stone a small piece is chipped out of the cast-iron surface and disappears; with a wrought-steel surface the metal is merely displaced, the portion moved ultimately becoming flattened down again. The difference in the nature of these metals also accounts for the fact that a steel-plated wheel has less tendency to slip than cast iron. This is particularly noticeable in hilly districts and when scarifying. Cast-steel wheels are more expensive, and, if hard enough to resist wear, soon polish and become smooth; consequently, they will not grip properly, and are altogether unsuited for hilly districts, or where rollers have to travel over square setts.

Electric Welding

Electric (not acetylene) welding has opened up great possibilities of repairs. Parts can now be made as good as new, when in the past they would have to be scrapped. Local thinning of fire boxes and tube plates can be built up; cracks running from firebox stays can be welded; worn shafts made good and damaged key ways repaired; broken castings and brackets welded; worn fork heads built up; broken teeth in gear wheels replaced, etc. In some cases loose spokes welded into wheel bosses, etc.

Keep Bolts Tight

Loose bolts are often the cause of breakdown. Every engine should be examined frequently and all loose bolts tightened up. Loose bolts will allow wear to occur in the bolt holes, the parts depending on them to get out of register, and wear. Throughout the engine wear begets wear.

Scarifiers and Their Effects

Hind-axle bracket and tender bolts require careful attention, particularly if the roller is used for scarifying. With independent scarifiers all the strain comes on these bolts. Some scarifiers rely mainly on the tender, which is the weakest part of the roller, for support. Tractive strains should be taken directly from the main axle and horn plates, and the tender insulated from vibration and shock as far as possible. Scarifying at the best is a trying operation; the scarifier and connecting parts should be kept in as good condition as possible. Ditcher and vibration from within the scarifier should be reduced to the minimum. Frames composed of channels and plates riveted together will allow vibration if the rivets are loose. Backlash or lift in the operating gear may be another source of similar trouble. To deal with the exceedingly hard and tenacious road surfaces of to-day scarifiers and their attachments should be made and maintained as rigid as possible.

Replacement of Parts

In the replacement of worn parts it is not always the soundest economy merely to put in a new part of the original type; in many cases improvement of design can be effected. As an example, cast-iron steerage quadrants, which fracture easily, may be replaced by wrought steel, which is practically unbreakable. In some makes of engines two gear wheels are made in one piece, one wheel of which will have more use than the other, and consequently wear out sooner. Economy can often be effected by parting the gears and replacing only the worn one. This also applies to those engines which the smoke box and boiler barrel are in one length. It is usually possible to cap a new smoke box on to the tube-plate joint without renewing the front-boiler barrel plates; this obviates the necessity of refitting the cylinder, etc.

It is unwise to put standard rings into a worn piston or cylinder. The piston-ring grooves wear on the sides and become shouldered; they should be faced up and wider rings fitted. Cylinders wear oval; replacement rings should be made oversize and bedded by hand to suit the worn conditions.

Steerage

Speaking generally, steerage gears require little attention. A simple, but not commonly known, means of increasing the life of a worn wheel is to remove it and replace it half-way round. This brings the least worn area into use.

General Remarks

The maintenance costs of steam rollers vary considerably. A careful driver, who knows his job and takes a pride in his engine, prevents breakdowns and reduces costs of maintenance.

Rollers working in hilly districts, or having to travel considerable distances to and from work, or which use bad water, are the most costly to maintain. One day's hard travelling will take more out of a roller than a month's ordinary work. It is a mistake to hurry a roller when travelling. Although it is obvious that scrapers should be slacked back when travelling, this frequently is not done.

A steam roller by makers of repute and well cared for has a life of many years. Road authorities often dispose of rollers for a nominal sum in order to purchase new, when the old roller, overhauled at a comparatively small outlay, would give many years' efficient service, thereby saving unnecessary capital outlay and depreciation charges.

In some instances rollers are entrusted for repairs to local engineers who have not the necessary practical experience, special plant, staff or mechanics accustomed to this class of work, with the result that the cost is higher than it should have been and the repairs far from satisfactory.

What is the Ideal Building Code?

The Portland Cement Association Have Developed a Set of Regulations That are Recommended as a Model for Widespread Adoption with Modifications to Suit Individual Requirements

In construction as in other fields of endeavor revision of the old to conform with known facts, is the order of the day. All over the country communities large and small are dusting off their building codes and comparing them with the latest knowledge of the strength, durability and fire resistance of common building materials. In nearly every instance some revision of the old code is found necessary—often complete rewriting.

The Portland Cement Association has contributed to the movement for better building codes a compilation of the latest available information relating to building construction. This compilation is in the form of a recommended building code for cities of 25,000 to 150,000 population. This code which is based upon a study of a large number of building codes, including the code of the Industrial Commission of Wisconsin, has already been adopted in its entirety, or with only minor changes, by a number of communities.

In the hands of those engaged in studies of existing codes this recommendation code will prepare the ground for an intelligent revision and will save a great deal of time and effort.

From time to time extracts from this code will be published as indicative of what is considered the best and latest practice in code compilation. In this issue is printed the part dealing with structural design, the sections being numbered as in the code:

Structural Design

Only the most general features of structural design are touched on in this code. Details are beyond the scope of this code and would be of no particular benefit. "Rules cannot produce or supersede judgment; on the contrary, judgment should control the interpretation and application of rules," whether the rules are general or detailed.

Either safety or economy, and often both, will be sacrificed unless both the designer and the builder have a competent knowledge of building construction in general and of the particular kind of construction which is being used.

Such details as are given in the following sections are typical, not restrictive. The building inspector will, on application, approve any other type of design which affords equal strength and security in accordance with standard practice.

Section 41. Floor and Roof Loads

The minimum stresses to be resisted by any structure shall be calculated by adding to the weight of the structure, called dead load, the following superimposed live loads uniformly distributed in pounds per square foot of horizontal area.

Theatres, Assembly Halls and Other Places of Assemblage:	
Auditorium with fixed seats	70
Lobbies, passageways, stairways and auditoriums or places of assemblage without fixed seats	100
Dance Halls	100
Theatre stage	150
School Buildings, Libraries and Museums:	
Class rooms and rooms for similar use	60
Corridors, laboratories and similar public parts of the building	80
Hotels, Dwellings, Apartment and Tenement Houses, Club Houses, Hospitals and places of Detention:	
Dwellings, first floor	40
Dwellings, floors above first	30
Private rooms and apartments (other than dwellings)	50
Public corridors, offices, lobbies, dining rooms, etc.	80
Office Buildings:	
First floor	100
Floors above first	60
Grand stands	100
All stairs	100
Workshops, factories and mercantile establishments	100
(In warehouses, workshops, factories and mercantile establishments used for the sale, storage or manufacture of heavy merchandise or machinery the floors shall be designed to carry all loads safely, including an allowance of at least 25 per cent. for vibration where vibration occurs.)	
Roofs	30
Sidewalks	150
(In any building where the maximum floor load is more than 150 lb. per sq. ft. the sidewalk must be designed to carry safely such maximum load.)	

Wind pressure, 25 lb. per sq. ft. of exposed surface, except as modified in Section 42.

The foregoing floor loads (but not the roof or sidewalk loads) may be decreased by 20 per cent. in buildings of fireproof construction.

Note. This reduction is permitted because (1) a fireproof floor suffers little or no deterioration; (2) a fireproof floor is not weakened by a fire below; (3) the greater dead load of a fireproof floor means that any accidental overload is a small proportion of the total dead and live load.

Concentrated, partial, and ecentric loading shall also be provided for.

The joists, beams, girders, columns, and walls supporting the roof shall be designed to carry the full loads.

Floor girders and trusses over 30 feet long shall be designed to carry not less than 85 per cent. of the live load besides the dead load; except that in hotels, apartment and tenement houses, hospitals, club houses, and office buildings they shall be designed to carry not less than 75 per cent. of the live load besides the dead load.

In a factory, store, warehouse or similar commercial building, the live load to be supported by walls, columns and foundations, shall be assumed at not less than 85 per cent. of the full live load of the top floor, 80 per cent. of the next lower floor and 75 per cent. for each succeeding lower floor.

In all other buildings the live loads to be supported by walls, columns, and foundations, shall be assumed at not less than 85 per cent. of the full live load of the top floor and 5 per cent. less for each succeeding lower floor until a ratio of 50 per cent. is reached, which shall be used for all succeeding lower floors.

Section 42. Wind Pressure

Except as modified in the last paragraph of this section, every building shall be designed to resist a horizontal wind pressure of 25 pounds for every square foot of exposed surface, in addition to the dead loads and the live loads specified above.

If the overturning moment due to wind pressure exceeds 75 per cent. of the moment of stability of the structure due to dead load only, the structure shall be anchored to its foundations, which shall be of sufficient weight to insure the stability of the structure; and sufficient diagonal bracing or rigid connections between uprights and horizontal members shall be provided to resist distortion.

The overturning moment may be disregarded in a structure less than 100 feet in height if the height does not exceed twice the width.

When the stress due to wind in any member is not greater than 50 per cent. of the stress due to the dead and live loads, it may be neglected. When the wind stress is greater than 50 per cent. of the dead and live load stresses, then the sum of all these stresses shall not exceed 150 per cent. of the stresses hereinafter provided.

Section 43. Foundations

The permissable loads on natural earth shall not be more than the following, in tons per square foot:

Quick sand and alluvial soils	½
Soft clay	1
Ordinary clay and sand together in layers, wet and spongy	2
Clay or fine sand, firm and dry	3
Sand, compact and well cemented	4
Gravel an dcoarse sand, well packed	5
Hard pan or shale	6

The maximum load on a timber pile shall not exceed 500 pounds per square inch, and shall be determined by the following formula:

$$L = \frac{2WH}{S + 0.1} \text{ for steam hammer}$$

$$L = \frac{2WH}{S + 1} \text{ for drop hammer}$$

in which formula

L = safe load in pounds.
W = weight of hammer in pounds.
H = fall of hammer in feet.
S = penetration under last blow in inches, assumed to be sensible at an approximately uniform rate.

Section 44. Masonry Construction

Masonry construction is that form of construction in which the material is laid up unit by unit and set in mortar.

Unit Stresses. The following unit compressive stresses (pounds per square inch) shall not be exceeded in masonry laid in portland cement mortar:

Clay or Sand-Lime Brick, Standard common (crushing strength 1,800 lb. per sq. in.) ..	175
Clay or Sand-Lime Brick, hard or select (crushing strength 3,000 lb. per sq. in.)..	270
Concrete Brick (crushing strength 1,500 lb. per sq. in., A.S.T.M., C3-22T)	200
Hollow Concrete Block or Tile or Hollow Clay Tile (on gross area)	90
Solid Concrete Block	150
Rubblestone Work	150
Cut-Stone Masonry other than Sand-Stone...	400
Sand-Stone Masonry	300

For any other type of masonry the unit stress shall be calculated on the basis of a factor of safety of 10 or more, in accordance with standard practice.

Mortar. Portland cement mortar used in laying up masonry shall be mixed in the proportion of one part of portland cement to not more than three parts of sand, by volume. Hydrated lime or lime putty may be added to an amount not exceeding 10 per cent., by volume, of the portland cement used.

Cement-and-lime mortar shall be mixed of one part of equal volumes of portland cement and lime to not more than 3 parts of sand.

Lime mortar shall be mixed in the proportions of one part of lime to not more than 3 parts of sand.

Whenever cement-and-lime mortar is used instead of portland cement mortar, the allowable working stresses on the masonry shall be reduced to 75 per cent. of that allowed with portland cement mortar.

Whenever lime mortar is used instead of portland cement mortar, the maximum allowable working stress shall be reduced to 50 per cent. of that specified for masonry laid up with portland cement mortar.

Masonry Bearing Walls. For all non-fireproof buildings except office building and buildings of the dwelling, apartment house and hotel class, the outside, party, division and other bearing walls shall be not less than 12 inches thick in the upper two stories, increasing four inches in thickness for each two stories (or fraction) below, except as hereinafter provided; no such two-story height shall exceed 30 feet. But the first story side walls of a three-story building may be 12 inches thick if laid in portland cement mortar and if the second floor joists are supported by wall hangers. Any wall which is not more than 50 feet long between crosswalls may be reduced to the thickness specified for fireproof buildings.

For all fireproof buidings, and for non-fireproof office buildings and buildings of the dwelling, apartment house and hotel class, the outside, party, division and other bearing walls shall not be less than 12 inches thick in the upper three stories, increasing 4 inches in thickness for each 3 stories (or fraction) below, except as hereinafter provided; no such three-story height shall xceed 45 feet.

A building not more than three stories in height may have 8-inch walls in the upper story, provided such story is not more than 10 feet high in the clear, and the roof span is not more than 25 feet, and the wall is not more than 60 feet long between cross walls, offsets or pilasters. A building not more than one story in height may have 8-inch walls provided the clear story height is not more than 12 feet, the roof span is not more than 25 feet, and distance between cross walls, offsets or pilasters is not more than 60 feet.

Dwelling houses two stories high may have 8-inch masonry walls in both stories provided the masonry is laid up in portland cement mortar having a lime content of not more than 10 per cent. of the volume of cement, and provided further that the clear story heights are not more than 10 feet.

All other one-story buildings shall have all bearing walls not less than 12 inches thick.

Eight-inch bearing partition walls may be 14 feet high in the clear, but not more than 40 feet long between pilasters or cross walls. But no 8-inch masonry wall shall serve as a party or fire wall, except in rows of dwellings.

Note (a). To secure proper protection against a severe fire it is recommended that division walls, and outside walls of fireproof or mill buildings, be made at least 12 inches thick of brick or 10 inches of plain concrete, or of reinforced concrete as described in Section 45.

Note (b). In case of long spans or heavy floor loads, the thickness of walls must be increased if necessary so that the allowable unit stresses will not be exceeded.

Every wall shall be bonded with header courses extending through the wall at intervals no greater than every sixth course.

If any horizontal section of any bearing wall shows more than 40 per cent. reduction of area on account of flues, openings or recesses, the wall shall be proportionally increased in thickness.

Masonry foundation walls shall be at least 4 inches thicker than the wall next above, and not less than 12 inches thick, except that one-story dwelling houses may have 8-inch masonry foundation walls if laid in portland cement mortar, and if the clear story height of the building is not more than 10 feet.

Note. Many cities permit the common practice of building 8-inch masonry foundation walls under two-storey dwellings of wood frame construction or of stucco on wood frame. This practice is recommended where soil conditions are normal.

Curtain Walls. Curtain walls of masonry supported at every floor level shall be not less than 8 inches thick.

Stone Walls. Stone walls shall be 4 inches thicker than required for walls of brick and shall be similarly bonded.

Stone or Terra Cotta Facing. Stone facing not less than 4 inches thick, and architectural terra cotta which extends not less than 4 inches into the wall and which is filled solid with concrete or with brick and mortar, may be considered as part of the required thickness as required for brickwork. No such wall shall be less than 12 inches thick.

Double Masonry Walls. In all masonry bearing walls that are built double, the quantity of material shall be not less than two-thirds of the quantity required for solid walls, and the parts of the wall shall be connected with approval ties placed not more than 24 inches apart, both vertically and horizontally.

Hollow Clay Tile. In buildings not over three stories and not more than 45 feet high, hollow clay tile may be used for outside walls and inside bearing walls, as well as for non-bearing partitions. Such tile (except for non-bearing partitions) shall have an ultimate compressive strength of not less than 700 lb. per sq. in. of gross area. In computing the gross area, no deduction shall be made for hollow spaces.

Each tile shall bear a permanent brand or mark identifying the manufacturer of the tile. A copy of said brand or mark shall be on file with the Building Inspector.

Note. Hollow tile should be of shape and material especially suitable for outside walls and should have undergone tests to prove its fire and weather resisting qualities; such walls should be further protected with 3/4 inch of cement plaster on the outside.

The hollow spaces in clay tile shall not exceed 55 per cent., except that in one-story buildings the hollow spaces may be 60 per cent. The absorption shall not exceed 12 per cent. of the weight of the tile in 48 hours.

Such walls shall be laid in portland cement mortar. The thickness of such walls shall be the same as required for brick walls, but no such wall shall be higher than 15 times its thickness.

Brick facing may be considered as part of a hollow clay tile wall (or vice versa) if the two materials are properly bonded with header courses not farther apart than every sixth course of brick.

Concrete Block Tile. Concrete block and tile for masonry bearing walls and piers shall be approved by the Building Inspector and shall meet the following requirements:

(a) Each block shall bear a permanent brand or mark identifying the manufacturer of the block. A copy of said brand or mark shall be on file with the Building Inspector.

(b) Before approval of the product of any manufacturer, compression and absorption tests on samples selected by the Building Inspector shall be made at the expense of the manufacturer at a laboratory of recognized standing. The ultimate compressive strength of hollow and two-piece units at 28 days must average 700 lb. per sq. in. of the gross cross-sectional area of the unit as used in the wall. The gross cross-sectional area of hollow building units shall be considered the product of the length by the width of the unit. The gross cross-sectional area of a two-piece concrete building unit shall be one-half the product of the length of the unit by the width of the wall for which the units are intended.

(c) The ultimate compressive strength of solid concrete building units at 28 days must average not less than 1,200 lb. per sq. in. of the cross-sectional area of the unit tested as used in the wall.

(d) The average amount of water absorbed in 48 hours by 3 units 28 days old shall not exceed 12 1/2 lb. per cu. ft. of concrete (actual volume) contained in any block.

(e) At least three samples of each unit tested for either compressive strength or absorption shall be selected so as to represent as nearly as practicable the average quality of the product of the manufacturer.

(f) The product of any manufacturer which has been tested within the next preceding six months may be accepted for use by the Building Inspector without being tested, but tests may be required at any time when in the opinion of the Building Inspector the product does not meet with the requirements of this code. Rejected block may be used in non-bearing partitions and in one-story structures outside the fire limits if specifically approved by the Building Inspector.

(g) Brick facing may be considered as part of a concrete block or tile wall (or vice versa) if the two materials are properly bonded with header courses not farther apart than every sixth course of brick.

Parapet Walls. All exterior, division and party walls of non-fireproof buildings shall have parapet walls not less in thickness than the wall below, carried to 3 feet above the roof and capped with incombustible material; but this paragraph shall not apply to buildings where frame construction would be permitted; nor to walls of buildings where not less than 10 feet of vacant space is maintained between the wall and the boundary line between premises.

Recesses. Recesses for water, sewer or other pipes shall not be deeper than one-third the thickness of the wall and the recesses around such pipe shall be filled with solid masonry for a space of one foot at the top and bottom of each story.

Old Walls. Walls heretofore built as party walls but which are not in accordance with the requirements of this section may be used if in good condition provided the height of the same be not increased.

In case it is desired to increase the height of an existing party or independent wall, which is less in thickness than required under this section, the same shall be done in one of the following ways:

(1) By a lining of masonry work, supported on a proper foundation, and forming a combined thickness with the old wall of not less than 4 inches more than the thickness required for a new wall; no lining shall be less than 8 inches in thickness; all lining shall be laid up in cement mortar, and thoroughly anchored to the old wall with suitable iron anchors, placed not over 2 feet apart, the old wall being first cleaned of plaster or other coating; or

(2) Such old wall may be increased in height if the new live and dead loads are uniformly distributed over the entire old walls by means of a distributing girder and if the total load does not exceed the allowable unit stresses; or

(3) The new wall may be carried by steel or concrete columns.

(To be continued)

Machinery & Equipment

New Type of Ingersoll-Rand Drill Cuts Mine and Quarry Costs

For several years there have been few improvements in the method of putting down deep holes in quarrying except the gradual substitution of compressed air power for steam in driving the reciprocating piston drill and the gradually increasing use of hammer drills of the Jackhamer or light drifter types.

There has recently been developed for this class of work and for heavy drifting and tunneling jobs, a very powerful hammer drill, which has established a remarkable record wherever it has been introduced. Results show that on quarry work alone it has equalled the daily footage of at least two large piston drills. This accomplishment has created a new era in quarrying because it has increased production and lowered costs.

This drill is known as the Ingersoll-Rand X-70 Leyner Ingersoll-Drifter. It appeals particularly to quarrymen, because in many rock foundations, it can be operated satisfactorily without water. This is sometimes an important consideration, especially in cold climates where pipe lines freeze in the winter. On the other hand, where conditions warrant it, water can be utilized.

The simplicity and ease of operation of this new drill wins favor with the drill runner and its rugged construction with consequent negligible upkeep cost and ability to stay on the job are important features which carry weight with the men who pay the bills.

Designed with ample hole cleaning capacity, it eliminates the time consumed by the use of the separate blow pipe. For the shallower holes, a push button blower device is provided which is conveniently located and easy to operate. For cleaning holes 20 ft. to 30 ft. deep during dry drilling, a special feature makes it possible to draw air from the air chest and to send it continually down to the bottom of the hole, thus effectually removing the cuttings.

Ingersoll-Rand X-70 on tripod in open cut work. Note length of steel used on the right

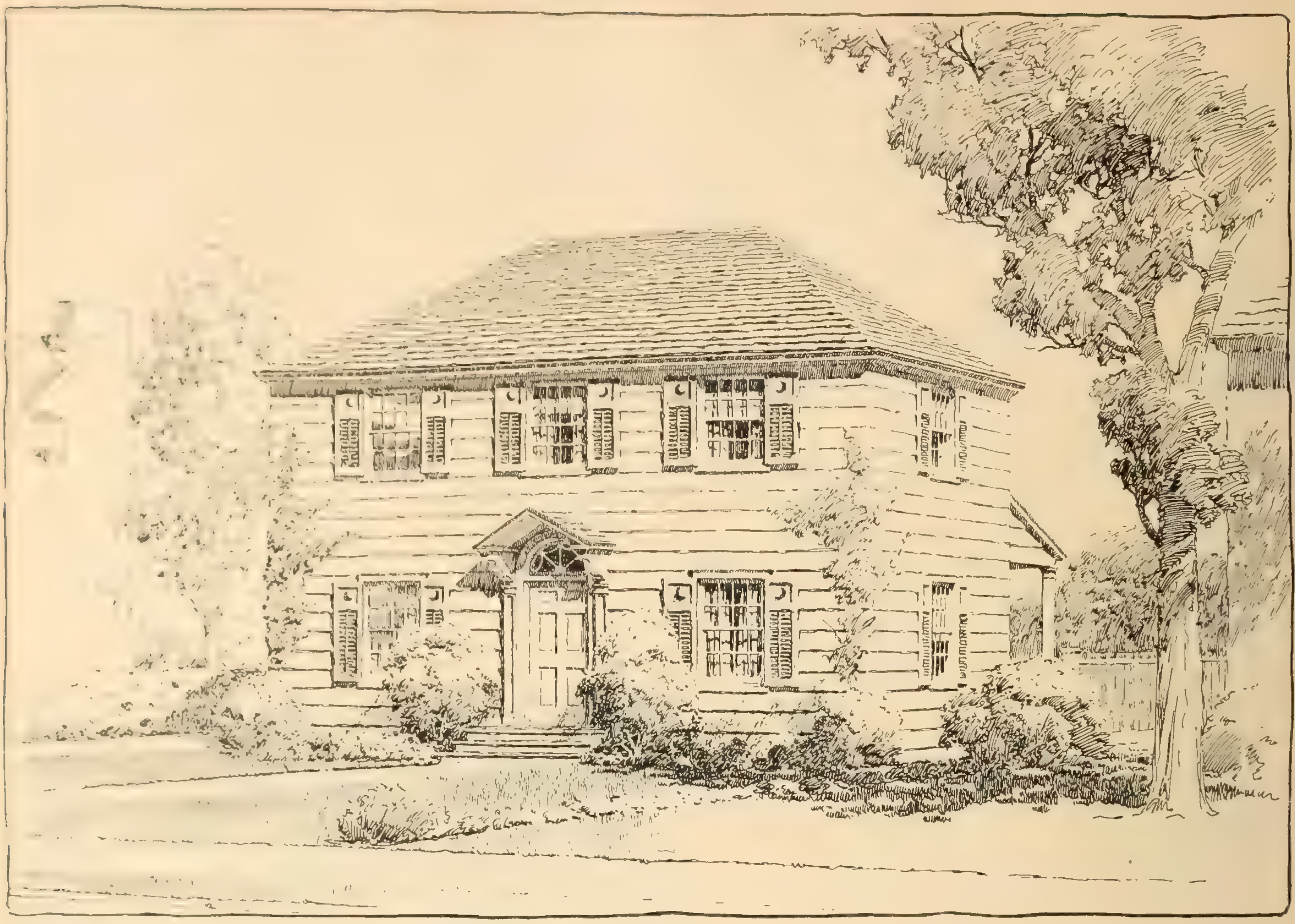
An extremely powerful "Sergeant" rifle bar rotation reduces to a minimum the tendency of the drill steel to stock by reason of any faults or seams in the rock; in fact, actual experience has proved that this new drill bottoms the steel to the last inch.

Its field is not restricted, however, to quarrying alone. It is being used extensively in mining and tunneling where large hard rock headings require cut and lifter holes of over 12 ft. in depth. It has also proved very successful where difficult rotation problems are encountered.

There are quite a number of these drills now being used in Canada and other parts of the Empire.

In a mine in Newfoundland this new machine recently accounted for 245 ft. of hole in six hours. An average footage of five other different drills in use at this mine on the same day was 137 ft.

The X-70 Leyner-Ingersoll-Drifter is made by the Canadian Ingersoll-Rand Company, 260 St. James St., Montreal, who will gladly furnish additional information to any reader interested in machinery of this type.



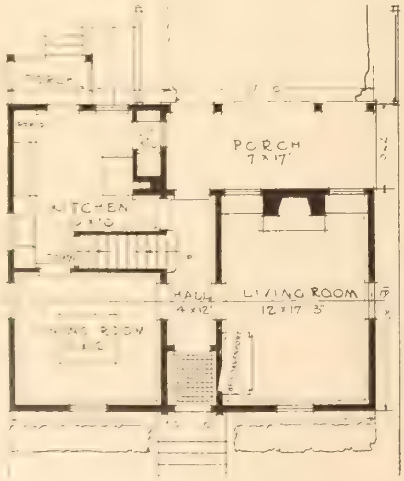
The Contract Record's

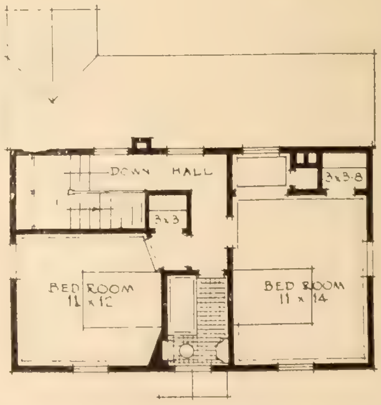
Weekly House Suggestion No. 79

A house combining all the beauty and dignity of the Colonial type of architecture is presented herewith on this page. The house is built of wide siding and in its soundness and economy of structure and its perfection of interior planning it preserves all of the best qualities of that early period of building. According to estimates of the Home Owners' Servise Institute, the cost of this house should be between $7,000 and $9,000.

The floor plans are so drawn, as may be seen from the accompanying sketches, as to simplify greatly the problem of enlarging the house later on should that be desired. In all considered modern designing the possibility of enlargement should be considered orignially and it is a decided advantage to work from plans where this has been done.

The location of the living porch in the rear of the house instead of the front is in conformity with the modern architectural trend. More and more of the better homes are being designed so that this feature of the house is kept away from the dust and noise of modern automobile traffic.





Mainly Constructional

East and West—From Coast to Coast

A correspondent from Hearst, Ont., reports that there is a fair amount of building activity in that vicinity. Also that W. Wickberg is contractor for a store being built for S. Draganoff.

A Halifax, N. S. correspondent advises that Russell & McAuley, contractors of that city, are building a $22,000 Masonic temple in Lunenburg, N. S. We are also advised that H. C. Redmond, contractor, Halifax, N. S., is at work on four schools which will be ready for September school openings; the average price of each school is $32,000. Two schools are for the Roman Catholic Board while the other two are for the Protestant School Board.

The Kamloops-Vancouver Grain Company propose to establish an elevator in Kamloops, B. C., for the purpose of handling prairie and local grain.

The Northern Construction Company, of Winnipeg, Man., has received contracts for the construction of 1,200 miles of railroad in China, from Canton to Chengtu, involving an expenditure of $20,000,000. Negotiations with the Chinese authorities were carried on by C. V. Cummings, vice-president of the company, who is in charge of the Vancouver office.

Bianco Bros. of Halifax, N. S., have returned from Jamaica, W. I. Islands, where they put in eight months building concrete culverts and bridges for the Island Railway Company. They now have contract for 3 miles of road at Chester Basin, N. S., at $6,000 and contract for sewer on Atlantic Street of Halifax, which they expect to start shortly.

The house or refuge board, Kitchener, Ont., will let the contract for the improvements to the institution in about three weeks.

A report from St. John, N. B., states that permits for new buildings, repairs, etc., for July totalled $58,500, in comparison with a total of $180,600 for the corresponding period last year.

Construction work has started on the new filtration plant at Levis, Que.

Plans have been prepared by the Masonic Lodge at Oakville, Ont., for the erection of a $20,000 temple.

A report states that the B. C. Growers' Association are now erecting two evaporating plants, one at Haztic and the other at Chilliwack, and a juice plant at Clayburn, B. C.

The McLean shingle mill, at Port Coquitlam, B. C., which was destroyed by fire about a month ago, will probably be rebuilt in the near future, if conditions are favorable.

Reports from Vernon, B. C., would indicate that the city is enjoying a building boom. Several new buildings and stores have been erected lately, and the pumping station in the city park is being pushed forward with all possible speed.

The new water works at Port Credit, Ont., is to be opened on August 18. This is said to be the finest west of Toronto. The cost of construction was $110,000. This will afford service for 300 houses.

E. P. Muntz Engineering Company, of Buffalo, N. Y., will commence operations in Canada shortly, with Canadian office at 402 Excelsior Life Building, Toornto; G. O. Fleming, vice-president.

Messrs. Pidgeon & Newson, proprietors of the Swift Current flour mill, Swift Current, Sask., are contemplating the erection of a new elevator on the site just east of their present mill. The new elevator will have a capacity of 30,000 bushels and will cost $100,000 to erect.

Reports state that building in Kitchener, Ont., is on the increase, permits for the erection of $364,030 worth of building during the past month, were granted compared with $107,026 last year for the same month.

The sum of $13,665 is to be spent by the Manitoba Government for repairs to government wharf at Selkirk, Man. Altogether, $195,000 is to be appropriated for work on the rivers and harbors of the prairie provinces.

Personal

Mr. J. J. Murphy is now with the Chicago sales force of Orton & Steinbrenner Co., manufacturers of locomotive cranes, etc., 608 South Dearborn Street, Chicago. Mr. Murphy was formerly the Chicago representative for the Browning Engineering Co. of Cleveland, Ohio.

Mr. Brian R. Perry, formerly with P. Lyall & Sons Construction Company, has joined the staff of the MacKinnon Steel Co. Limited, of Sherbrooke, Que., and is in charge of the company's sales office at 404 New Birks building, Montreal, from which office he will handle all business in Montreal and vicinity. Mr. Perry is a graduate of McGill university and has had extensive experience in construction work.

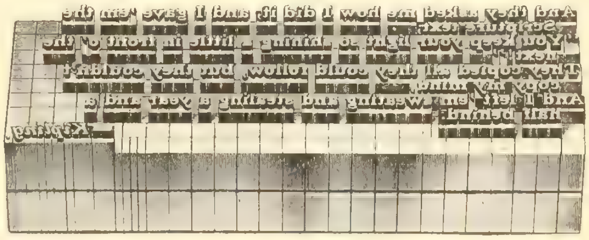
Obituary

The death occurred in Hamilton, Ont., recently of Mr. Richard Herod, at the age of 73 years. Mr. Herod was well known in Hamilton as a contractor.

Trade Incorporations

Ontario Tile Co. Ltd., with head office at Windsor, Ont., capital $50,000, to manufacture clay products and plastic materials and building materials of all kinds.

Tells of Printing



How type itself looks to the printer

The publishers of this paper have just recently produced a most attractive and interesting 32-page booklet. Hugh C. MacLean Publications Limited, have spared neither time nor expense in turning out this brochure descriptive of advertising, printing, engraving and allied trades. A very interesting illustrated history of the growth of the business newspaper in Canada is included as Hugh C. MacLean was one of the pioneers in answering the requirement of industry and business for newspaper and periodicals that were capable of discussing trade and technical problems in an intelligent manner.

Owing to the high cost of this booklet, the publishers regret that they can only supply representative business men.

Printed Salesmanship
Department E
349 Adelaide West, Toronto

CONSTRUCTIONAL ACTIVITY

Period of August 8 to August 14, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Fonthill, Ont.

A by-law for a new waterworks system will be submitted to the ratepayers of Fonthill, Ont., on August 23. Engineers are James, Proctor & Redfern, Toronto.

Crystal Beach, Ont.

The town council is having plans prepared for the laying of sewers at the west end of the town, which will cost $20,000. Engineers are Ross & Scott, Welland, Ont.

Tilbury, Ont.

Thorold, Ont.

Tenders being received by John A. Clark, Fonthill, Ont., no closing date set for the following concrete sidewalks: 13.740 sq. ft.—Beaver Board District; 720 sq. ft.—Pt. Robinson.

Tenders are being received by C. Day, town clerk, no closing date set, for laying sewers on Maple avenue—approximately 1,000 ft. 18 in. concrete drain sewer pipe, depth 2 to 3½ ft. (trench).

Toronto, Ont.

Tenders being received by C. A. Maguire, chairman, Board of Control, till October 9, for (44) A 80 million imp. gal. low lift centrifugal pump; (45) A 25 million imp. gal. pumping engine; (46) one A. C. generator; (47) 16 in. C. I. pipes; (48) 36 in. C. I. pipes (a); (40) 36 in. C. I. pipes (b); (50) 16 in. and 36 in. stop valves; (51) 16 in. and 36 in. C. I. special castings; (52) 72 in., 60 in. and 48 in. valves. Specifications at room 12, city hall.

Walkerton, Ont.

The town council contemplate a waterworks system to cost $20,000; engineer, Fred B. James. The ratepayers of Walkerton recently passed a by-law for new stand pipe, pumps and repairs to present reservoir.

CONTRACTS AWARDED

Acton Vale, Que.

The town council has awarded the Canadian Allis Chalmers Ltd., Montreal, the contract for pumps, electric and gasoline motors at $8,000. in connection with waterworks system.

Dunnville, Ont.

The town council has awarded the contract for concrete pavement to be laid on Broad street, to Britnell Contracting Co., Toronto—$40,527.

Duncan, B. C.

Mr. Donald Cameron, contractor for the new waterworks system, has purchased approximately 10,000 feet of wood stave pipe with steel couplings and burlap jacket manufactured by Canadian Pipe Company, Ltd.

Esquimalt, B. C.

The Waterworks company has purchased approximately 14,000 feet of 12 in. steel coupling wood stave pipe manufactured by Canadian Pipe Co. Limited.

Lethbridge, Alta.

The Crown Paving Co., Calgary, Alta., have received the contract for paving and laying of sidewalks to cost $35,235.-75.

Montreal, Que.

The Montreal Harbor Commission is the general contractor for laying of sewer in Nicolet street, $38,423.

Orillia, Ont.

The town council has awarded the contracts for laying of sewers to H. Caswell, in amount of $8,582.

Point Grey, B. C.

Work is to start at once on the laying of water pipe at various locations. The work will cost $15,750; Gordon & Belyea, Vancouver, are the general contractors for 5,000 ft. 4 in. cast iron pipe; 10,000 ft. 6 in. cast iron pipe; 1,000 ft. 8in. cast iron pipe and 1,000 ft. 10 in. cast iron pipe. The pipe is to be manufactured by the Pont-A-Mousson Foundries, France. Messrs. Gordon & Belyea are the British Columbia distributors for this firm.

Robson, B. C.

The Robson Irrigation district has almost completed its new system including approximately 23,000 feet of steel coupling wood stave pipe supplied by the Canadian Pipe Co. Limited, of Vancouver, B. C.

Revelstoke-Arrowhead Road.

The following contracts have been awarded for roadwork; F. Alexander, Revelstoke, B. C., on unit basis, at approximate cost of $8,700—2 miles; Oziro Bros., Revelstoke, B. C., on unit basis, at approximate cost of $2,350—1 mile.

Sandwich, Ont.

The town council contemplate the laying of sewers on Randolph Ave. from Craig street, northerly to lot 566, at end of present sewer.

Toronto, Ont.

Tenders being received by C. A. Maguire, chairman, Board of Control, till August 21 for asphalt pavements on Boston, Cinder, Lawlor, Merrill and Woodington avenues; Glenmount Park road, Stafford street, Wolverleigh boulevard.

York Twp., Ont.

The following contracts have been awarded by the township council for asphalt pavements; Arlington and Kendal avenues $14,700—Constructing & Paving Co; Langford avenue $4,700—Kilmer & Barber: all of Toronto.

Public Buildings, Churches and Schools

Birchcliffe, Ont.

The town council is preparing plans for the erection of $25,000 fire hall.

Burnaby, B. C.

Tenders have been received by the Burnaby school board for the erection of a $19,000 school; architects, Bowman & Cullerne, Vancouver, B. C.

Cartierville, Que.

Plans are being prepared for a hospital and sanitarium. This is to replace the Hospital for Incurables destroyed last winter in Notre Dame De Grace; architects, Viau & Venne, Montreal.

Fort William, Ont.

Work is to start at once on the painting and decorating of post office and customs building; F. J. Poulter, Fort William, Ont. is the general contractor.

Ford, Ont.

Tenders have been received by the public school board for the erection of a $210,000 school near Drouillard road; 2 stories, 8 rooms, brick and tile construction.

Grande Prairie, Alta.

Tenders will be received by R. C. Desrochers, secretary, Department of Public Works, Ottawa, till August 28, for the supply and installation of post office fittings in the public building. Plans and specifications with Department of Public Works, Ottawa.

Guelph, Ont.

Tenders for plumbing and heating in connection with $137,000 memorial hall to be erected, will be received till August 18 by H. G. McNaughton, secretary, Parliament Buildings, Toronto.

Hanover, Ont.

Tenders are being received by Wm. Ruttle, secretary, High School Board, till August 25, for the erection of a $60,000 high school; 2 stories, 6 rooms and auditorium, solid brick construction architect, Wm. G. Murray, Dominion Savings Building. Plans and specifications with secretary and architect.

Haileybury, Ont.

Tenders have been received for the plumbing and heating system in connection with court house being erected.

Work on the new fire hall is in progress and building is being erected by day labor under supervision of G. T. Hamilton, Chairman of Fire & Light Commission.

Kerwood, Ont.

Plans and estimates are to be secured by the Anglican congregation for the erection of a Parish Hall; rector, Rev. H. R. Diehl, R. R. No. 5, Strathroy, Ont.

Point Grey, B. C.

Tenders for the erection of a $30,000 fire hall will be received by municipal clerk till August 22. Plans and specifications with municipal clerk.

Prince Albert, B. C.

Plans are being prepared for alterations to hospital. The work includes central heating plant; erection of third floor to main building and sound proofing walls and floors of second floor; also the purchase of elevator of push button automatic type.

CONTRACTS AWARDED

Brandon, Man.

The following contracts have been awarded in connection with hospital for mental diseases: plumbing—Bowyer, Boag, Ltd., Winnipeg, $26,011; temperature control—Johnson Temperature Control Co., $9,764; ventilating—Western Cornice & Roofing Co., $3,070; heating—Yates. Neal & Co., labor $5,771; radiation, $6,698.

Claremont, Ont.

J. McIntyre, Whitby, Ont., has received the contract for electrical work on $35,000 school which will be erected shortly.

Erin, Ont.

The following trades have been let in connection with $30,000 school being erected; plumbing, P. A. Moore, 939 King E., Hamilton; painting, Kirk & Son, 205 Charlton Ave. West, Hamilton.

Edmonton, Alta.

The Edmonton Public School Board has awarded the contract for 2 low pressure heating boilers, $5,488 and $4,704, to be installed in Garneau and Norwood schools, to O'Neil & Morkin, Ltd.,

Hamilton,. Ont.

W. H. Cooper, Clyde building, is the general contractor for addition to general hospital, at $95,702; reinforced steel Trussed Concrete Steel Co. of Canada; structural steel, Hamilton Bridge Co., Limited; ornamental iron, Olmstead Iron Works; tenders in on plastering, glass and cut stone.

The following contracts have been awarded in connection with alterations and addition to Cannon street school; electric, Electric Supply Co. Ltd.; plastering, Hill Bros.; painting, W, W. McIlroy; sheet metal, roofing and galvanized iron, G. & J. Inrig.

Work is in progress on residence being altered into maternity hospital for St. Joseph's hospital to cost $22,000; Otis Fensom Elevator Co. Ltd. is supplying the elevator, and Hill Bros. have the contract for plastering.

Haileybury, Ont.

Joseph Sherwood, Haileybury, Ont., is the general contractor for the erection of a separate school.

The foundation is now in for court house being erected on Main street; the following contracts have been awarded: steel, Hamilton Bridge Co.; cut stone, John Vokes & Sons, Limited. face brick. Milton Pressed Brick Co. Ltd., all of Toronto.

Huntsville, Ont.

Work is to start soon on $24,000 addition to school, and the following subtrades have been let: plastering, masonry and brickwork, Beston & Jones; carpentry work- Walter Knight; plumbing, heating and ventilating—Hiram Hebner.

Montreal, Que.

Plans are being prepared for the erection of a $200,000 college near Mile End; J. E. De Patrick, 381 Fourth avenue is the contractor, and would like to have suggestions and prices on all materials for the above.

The foundations are going in for $40,000 presbytery on Chamblay street, near Rouen; general contractor, N. Beauchamp; roofing, plumbing and heating—J. E. Hardy; electric—O. Tardif.

The stonework is now being done on the city hall. The following contractors tendered for floors and roof: A. & D. Boileau—$327,400; Ulric Boileau Ltd.—$334,800; J. A. Durocher—$343,750; Atlas Construction Co. Ltd.—$343,750.

Plans are being prepared for the erection of church on Dandurand, for Parish St. Francois de Solano. architect, J. E. De Patrick, 381 Fourth avenue. Prices on steel work wanted by architect.

Foundations are in for $228,111 school on Rielle street; plastering is being done by Peter Baxter, 263 St. James street.

D. Boileau, 243 McDougall street, is the general contractor for the erection of a convent at Laval de Rapids for the Sisters of Immacuile Conception. 3 storeys, 46 x 100, brick construction; architect, Jos. Sawyer, 243 McDougall street.

Mitchell, Ont.

The contract for building of high school has been awarded to Wm. Eizerman & Sons, general contractors, at $40,000; masonry work, John Avery & Son. Separate tenders to be called shortly by architect H. C. McBride, Molsons Bank, on steam heating and plumbing.

Niagara Falls, Ont.

Plans are being prepared for a new bathing house on Dufferin Island. 1 storey, 21 x 136, frame construction; architect, C. H. Acton Bond, 4 Wellington E., Toronto.

Nanaimo, B.C.

The Nanaimo Hospital Board contemplate the erection of a hospital at a cost of $150,000; 2 stories, concrete foundation, brick and tile construction; tenders will be called soon for various trades.

Newcastle, N. B.

The contract for the construction of St. Mary's new school has been awarded to D. Morrison & Sons, the contract price being in the vicinity of $54,000; 2 storey building, 68 x 86 ft.

North Easthope Twp., Ont.

The following have contracts in connection with $9,000 school being erected: general contractor, Conrad L. Forler; plumbing and heating, Geo. Steines; plastering, J. Ruehl; painting, J. Fisher. all of New Hamburg, Ont.

Outremont, Que.

Work is to start shortly on school to be erected on Lajoie avenue; plumbing and heating is being done by John Colford & Co.

Plans are being prepared for the erection of a $20,000 hall on Davarr avenue, for the Outremont Presbyterian church; architect, K. G. Rea, 285 Beaver Hall Hill.

The Protestant School Board has awarded the contract for new school to McRitchie & Black, 14 Sussex avenue.

Peterboro, Ont.

The plastering is to start on $28,000 Salvation Army temple. Electrical work, Miller, Powell & Watson; plastering, W. Saxby; painting, Coleman Bros.

Quesnel, B. C.

Plans are being prepared by the Quesnel Hospital Board for the erection of an $11,000 hospital; 2 storeys, 30 x 67; tenders will be called soon.

Raymour, Sask.

Tenders have been received by the Raymour School Board for the erection of a 20,000 school. 2 storeys, 33 x 69, brick and tile construction.

Sherbrooke, Que.

Plans are being prepared for the erection of a normal school to cost $300,000. 4 storeys, 120x 50; architect, L. N. Audet & J. O. Marchand. A supervising contractor and a general buyer will be engaged shortly.

Sydney, N. S.

Foundations are in for addition to school on Park street, 2 storeys, 2 rooms and larger assembly hall; general contractor, Chapells Limited; plastering and brickwork, H. M. Israel, Brookland street.

Timmins, Ont.

Tenders being received by the architects, Pennington & Boyde, Windsor, till August 20, for the erection of a high school; plans and specifications with H. E. Montgomery, secretary; Contract Record, 347 Adelaide W., Toronto, and with architects.

Tilbury, Ont.

Tenders are being received by the town council on all sub trades, no closing date set, for the erection of a public library at a cost of 7,000; 2 storeys, 28 x 38; concrete block foundation, brick construction, asphalt roofing, electric lighting, steam heating, maple flooring, fir trim; plans and specifications with town council.

Toronto, Ont.

Fred G. Roberts & Co. Ltd., have received the painting contract for new $250,000 car barns being erected on Roncesvalles avenue.

A church and Sunday school is to be erected on the west side of Shaw St., near College, for the Reformed Episcopal denomination, at a cost of $55,000.

Tenders have been received by Belfry & Wilson, architects, for a sunday school to be erected at south west corner High Park Ave., & Annette street for the High Park Methodist church, at a cost of $100,000; 3 storeys and basement, 70 x 140. steel and brick construction.

The Hospital for Sick Children contemplate the erection of a convalescent home. Options have been secured on several sites in the northern section of the city.

Hubert & Clark, 476 Delaware avenue are doing the plastering work on church being built for the Advent Christian church, Crawford street.

The following contracts have been awarded in connection with church being built at Lansdowne and Wallace avenues; masonry—B. Robyn; carpentry—Topple & McDonagh; roofing—A. W. Carmichael Limited; plumbing, F. R. Maxwell.

The walls are going up for $55,000 church on west side Shaw street, north of College; roofing— Duthie & Sons Ltd.; electric and painting trades to be let.

The following sub-trades have been let for alterations to theatre at 25 Adelaide west; general contractor, W. W. Petley & Co.; ventilating, Saturley & Bushell; plumbing and heating, Young & O'Neill.

Vancouver, B. C.

The following sub contracts have been

awarded for a comfort station to be erected at a cost of $21,900, general contractor, Adkinson & Dill; excavation, Nicholas Casco, electric, Jenkins Electric Co. Ltd.; plumbing, Barr & Anderson; glazed brick and tile, W. T. McArthur & Co.

Work is to start at once on $21,900 public comfort station No. 3 corner [illegible] and Georgia street, west. Messrs. Adkinson & Dill are the general contractors.

Watson, Sask.
A. Stadelman, Englefeld, Sask., is the general contractor for the erection of a school to cost $7,592.

Westmount, Que.
The foundations are now in for parish hall being erected near Sydney, at a cost of $10,000. 1 storey, 26 x 36; architect, Leonard Cunningham, 198 Charlotte street. Work day labor by owner, [illegible] Parish, Sydney.

Winnipeg, Man.
Plans are being prepared for an addition to hospital, corner Preston and Arlington streets, to cost $100,000; 4 storeys; owner, Salvation Army; architect J. N. Semmens, Winnipeg.

Woodstock, Ont.
The contract for addition to Central school has been awarded to W. J. Taylor, general contractor, at $52,420.

York Twp., Ont.
The contract for grading etc., in connection with $80,000 addition to school, has been awarded to G. Thomson, 55 Holland Park avenue, Toronto. $5,000.

The following contracts have been awarded in connection with the addition to John R. Wilcox school (Fairbank); masonry, H. N. Dancy & Son; carpentry, F. Markham; roofing, Douglas Bros.; electrical, Roxborough & Dean; plumbing and heating, Robert Jordon; plastering, R. C. Dancy, 57 Kendall avenue; painting and glazing, F. Burrows.

Business Buildings and Industrial Plants

Edmonton, Alta.
Tenders will be received by LaFleche Bros. for the addition of another storey to their present building at 10047-102nd street. No closing date set. Plans and specifications with owners.

Calgary, Alta.
Tenders will be received by the architect, W. S. Bates, 48 Canada building, Calgary, Alta., for alterations and remodelling of bank, including new vaults, steel cages, special woodwork, plate glass windows, changing of doors, stone work, brickwork, plaster work, electrical work, and painting etc. No closing date set. Plans and specifications with architect.

Charlottetown, P.E.I.
Tenders being received by R. C. Desrochers, secretary, Parliament Buildings, Ottawa, Ont., till August 21, for placing new felt and gravel roofing on deck of roof and sloping portions, old Canadian Bank of Commerce buildings; plans and specifications at Dep't. and Clerk of Works, Dep't. of Public Works, Charlottetown, P. E. I.

Hamilton, Ont.
The Canadian Westinghouse Co. contemplate the erection of a foundry building on Aberdeen west; tenders being received by architect, B. H. Prack, Main St. E. Hamilton, and 50 Bay St., Toronto, till August 20; 1 storey, 205 x 550. steel frame, reinforced concrete construction.

Malagash, N. S.
Mackay & Chambers, New Glasgow, N. S., contemplate the erection of a new plant. Temporary repairs are being made to their plant which was recently destroyed by fire.

Montreal, Que.
Atwater Construction Co., 643 Champlain street, is the owner and builder ot an apartment house on Atwater avenue, which will cost $90,000.

The erection of a $600,000 Masonic temple is contemplated by the Masonic Lodge. Location for same has not yet been decided upon.

Work has started on $15,000 new factory being erected at 615 Beaudry street; 3 storeys, 50 x 100, solid brick construction; owner and builder, F. X. Boyer, 792 St. Hubert street. Tenders wanted at once on roofing, electric, plumbing heating, painting, brickwork, sash and doors, and freight elevator.

Oshawa, Ont.
Tenders have been received by the Oshawa Curling Club, for the construction of a curling rink.

Oliver, B. C.
Tenders will be received by the Minister of Public Works, Victoria, B. C. till August 25, for the erection of government offices; 1½ storeys and basement, concrete foundation, frame construction, shingle roofing. Plans and specifications with Department of Public Works.

Peterborough, Ont.
A planing mill and box factory is being erected for the Dick & Carew Lumber Co., Limited; 1 storey, 116 x 50; work by day labor under supervision of Jas. Finnie.

Toronto, Ont.
Harry R. Browning, 465 St. Johns road, is the owner and builder of 2 pair stores and apartments to cost $30,000 on north side of Bloor St. near Windermere avenue; 2 storeys, brick construction.

The Lake Simcoe Ice Co., recently received tenders for the erection of an ice house and driving shed etc., at Willowdale; architect, F. S. Mallory, 364 Bay Street.

Gelber Bros. Ltd., 217 Richmond St. W. are the owners of a light manufacturing building to be erected at 207-215 Richmond west, at a cost of $125,000; 7 storeys and basement, mill and brick construction; architect, Ben. J. Brown, 287 Spadina avenue. Bulk and separate tenders being received by architect, to close about August 20.

Tenders will be called shortly for 2 storey addition, 59 x 184, to warehouse at 60-2 Front East; owner, S. Frank Wilson & Sons, 73 Adelaide West; architect, W. L. Symons, 119 Bay St.; mill and brick construction.

Victoria B. C.
Tenders have been received by the Canadian Pacific Railway for the erection of a $200,000 marine terminal building which is to be erected on Belleville street; 4 storeys, cast stone construction.

Vancouver, B. C.
Plans are being prepared for the erection of a $15,000 warehouse for the Massey-Harris Co. Ltd.; 1 storey, frame construction; architects, Gardiner & Mercer. Tenders will be called soon.

Work is to start at once on the remodelling of telephone exchange, which will cost $15,000. Considerable interior changes and alterations and new plumbing and fixtures to be installed.

Plans are being prepared for an addition to store of Sommers Limited, 556 Granville Street, to cost $150,000; 3 storeys, 40 x 50, architects, sharp & Thompson, 708 London building, Vancouver.

Warwick, Que.
Warwick Woolen Mills Co., are the owners of a $60,000 factory being erected, and are asking for tenders on sprinkler system and prices on steam heating. Balance of work by day labor.

Walkerville, Ont.
Plans are being prepared for the erection of a $10,000 store on Monmouth road; 1 storey, 30 x 100. brick construction; owner, John L. Stark, 284 Monmouth road.

Westmount, Que.
Tenders have been received and will probably be let shortly, on roofing, electric, plumbing, heating and plastering, in connection with garage and residence being built at the s. e. corner Claremont & Willow; 2 storeys, 75 x 35; owner, R. Ouimet, 182 Mansfield St. brickwork and painting by day labor.

Weston, Ont.
Tenders have been received by the Bell Telephone Co. for the erection of a telephone exchange. Norman McLeod Limited, Kent building, Toronto, want prices on sub-trades.

Plans are being prepared by Weston Theatre, Ltd., for the erection of a $60,000 theatre on Main street; architects, Hall & Duerr, Lumsden Building, Toronto; 2 storeys, brick construction; seating capacity 741; stores and offices on side; tenders will be called about August 18.

Winnipeg, Man.
Plans are being prepared for an addition to office building on Portage avenue, east; 1 and 3 storeys, 25 x 88; owners, Canadian Westinghouse Co. Ltd., Hamilton, Ont.; architect, J. H. G. Russell, Winnipeg.

CONTRACTS AWARDED

Brockville, Ont.
Excavating has started for $20,000 office building, corner Court House avenues and Kint street, 3 storeys, 48 x 30, brick construction. electrical work is being done by R. H. Smart Limited; painting and glazing—Travers Fitzpatrick, Maple street.

Barrie, Ont.
The Ball Planing Mill Co., are the general contractors for $22,000 addition to Wellington hotel.

Dutton, Ont.
W. Saunders has been awarded the contract for the new Royal Bank building and work is to commence at once.

Edmonton, Alta.
Work is to start at once on $45,568 addition to warehouse for Campbell, Wilson & Horne Limited. The General con-

tractor is H. G. MacDonald, 612 Tegler Building, Edmonton.

Haileybury, Ont.

Dickie Construction Co., Toronto, is the general contractor for $30,000 bank being built for the Bank of Nova Scotia; 2 storeys and basement, 50 x 36.

Hamilton, Ont.

Alb. H. Schwenger, 18 Balmoral avenue, north, is doing the electrical work for apartments being erected on Main street, east. Owner and builder, A. McMullen, 26 Balmoral avenue, north.

Work is to start at once on erection of factory for the Quaker City Chemical Co.; W. H. Cooper, Clyde Block, is the general contractor and will let sub-trades.

The Duron Construction Co. 1 Main St. East, Hamilton, is the general contractor for stores and apartments being erected on King east, near Ferguson; 3 storeys, 6 apartments; 3 stores, brick construction.

Lansing, Ont.

Geo. L. Robinson, 107 Armstrong avenue, is the general contractor for $20,000 bank being erected for the Sterling Bank of Canada; architect, Langley & Howard, Toronto.

Montreal, Que.

Denise Contracting Company are the general contractors in connection with $20,000 extension to railway depot for Montreal Southern Counties Railway.

The following sub-trades have been let for $25,000 molasses distillery, 1706 Notre Dame street, east: steel, Dominion Bridge Co. Ltd., Lachine, Que.; electrical work, Vincent & Say Electric Co.; plumbing and heating, McAulley & Tucker.

The following sub-trades have been let in connection with stores and 2 flats being erected on Sherbrooke street: general contractor, U. Sauvageau; brickwork, R. Rochefort; roofing, Mr. Bernier, care general contractor; electric, J. O. Deschesne; plumbing and heating, J. E. Gagnon; plastering, J. Lefebvre; painting, Mr. Frigon, 2504 Adam street; marble and tiling, Dussard, Joly & Mongeon.

The foundations are in for the new factory being erected for the Berliner Gramaphone Co. E. B. Evans, 74 Easton avenue, Montreal, West, is the general contractor.

The following have received contracts in connection with $15,000 repair shop being erected at 57 Osbourn street: roofing, Metal Shingle & Siding Co.; electric, Acme Electric Co.; plumbing and heating, E. Tremblay & Co.

Port Colborne, Ont.

M. Zeleiskie, is the owner and general contractor for a boarding house to be erected at a cost of $12,000 on Omar street; 3 storeys, 30 x 55; plumbing, Harrison & Phillips, 462 Main street, east, Welland, Ont.; balance of sub-trades to be let.

St. Catharines, Ont.

Dr. E. Davis, 5 King street, is the owner of 4 apartments being erected at 29 William street, to cost $10,000; 2 storeys, 36 x 44; masonry, E. Corman, 35 Cherry street; heating and plumbing contract will probably be let to H. A. Bald, 3 Academy street, St. Catharines.

Sarnia, Ont.

The following contracts have been awarded in connection with office and stores to be erected corner Victoria and Lochiel streets, at a cost of $35,000; excavating and masonry work, T. Grace; structural steel, Sarnia Bridge Co.

Sorel, Que.

The following contracts have been let in connection with $75,000 hotel being erected; plastering and brickwork, Mr. Charbonneau, Sorel, Que.; plumbing and heating, Mr. Gauthier, Sorel; painting, Mr. Payette, Sorel, Que.; roofing and electric, by day labor.

Toronto, Ont.

Messrs. Robertson & Findlay are doing the plastering work on $125,000 factory being erected on Symington avenue and C. P. R. Tracks; 1 storey and basement, 58 x 250, reinforced concrete construction. Painting to be let next week.

Walls are going up for $110,000 garage etc., being built for the City Dairy Co. Ltd., north side Bancroft street; 3 storeys, 80 x 100. The painting is being done by Fred G. Roberts & Co., Ltd.

The following contracts have been awarded in connection with $95,000 recreation club being built on west side Dufferin street, near St. Clair; painting—Geo. Dawe; steel— Hepburn & Disher Limited; steel chairs—McGregor & McIntrys Ltd.; roofing, J. H. Hines & Son; carpentry—Shaw & Hamilton; all of Toronto.

Work is to start at once on $15,000 addition to factory No. 8 for the Massey-Harris Co. Ltd.; Archibald & Holmes, 709 Yonge street, are the general contractors.

The Contractors Haulage Co., is doing the excavating work on 7 storey manufacturing building being built corner Spadina avenue and Phoebe street for the Empire Clothing Mfg. Co.

Work is to start shortly remodelling theatre south east corner Clinton and Bloor streets, into apartments; owner, A. Bartello, 691 Bloor W. architect, Neil C. Beggs. 6 Jean street; Robert Bros., 41 Dovercourt Road, general contractors.

Vancouver, B. C.

Messrs. Harrison & Lamond, Vancouver, B. C., are the general contractors for $22,000 warehouse and showrooms being erected for Massey-Harris Co. Ltd., on Terminal avenue, False Creek.

Work is to start at once on 6 small stores being erected at 1503 Fourth avenue, west; to cost $9,500, 1 storey, 43 x 120, brick and hollow tile construction; owner, Pemberton & Son; general contractor, T. A. Allan, 407 Bank of Nova Scotia building.

Westville, N. S.

Edison Fraser, general contractor, New Glasgow, N. S., has received the contract for the erection of new $16,000 Oddfellows' hall.

Winnipeg, Man.

H. Sigurdson, 808 Great West Permanent Loan building, is the general contractor for the erection of workshop and office building, corner Sargent and Toronto streets, which will cost $20,000; general contractor desires prices at once on all sub-trades.

The foundation is in for filling station on Smith street, north, for the Pure Oil Company. Messrs. Wallace & Aikins, Limited, are the general contractors. Plumbing—Cotter Bros, Fort Street, Winnipeg, Man.

The walls are now going up for $30,000 apartment on Osborn street. The following sub-trades have been let: millwork, Winnipeg Paint & Glass Co. Ltd.; roofing, sheet metal and ventilating—MacDonald Bros. Sheet Metal & Roofing Co. Ltd.; electric—McDonald & Wilson; plumbing and heating—Townsend Plumbing and Heating Co. Ltd.; plastering—Fred H. Lawrence; painting and Glazing— Touring and Shellrude.

West London, Ont.

John Puterbough, 396 Talbot street, is the general contractor for the erection of $300,000 arena at Tecumseh Park; 131 x 242, steel frame, seating capacity, 4,000; architects, Watt & Blackwell, Bank of Toronto Chambers.

Residences

Islington, Ont.

J. B. Crocker, 123 Quebec avenue, contemplates building 4 residences shortly on Botfield avenue.

Longueuil, Que.

The foundations are going in for $12,000 semi-detached residence on Labonte street; 2 storeys, 24 x 44, frame and brick construction. Owner and builder, A. Millette, may do all work by day labor.

Montreal, Que.

Excavating has started for $13,000 residence on Beaudry, between Robin and Demontigny; 3 stories, 31 x 66. Owner, J. Martineau, 521 Beaudry street.

J. Paradis, St. Jerome. Que., is the owner and builder of 2 residences on St. Gerrard, to cost $12,000; 2 storeys, 30 x 52, frame and brick construction. Owner will probably let sub-trades.

Excavation has started for 3 flats being erected on St. Urbain St., at a cost of $14,000. The general contractor is B. Kaplan, 1016 St. Urbain St.

Work has now started on $12,000 residence being erected at 508 Sherbrooke west, for Dr. A. Craig, owner, 510 Sherbrooke west; 3 stories, 25 x 80, brick construction. Owner will probably let contract.

R. Roberts, 65 Hutchison, is the owner and builder of a $15,000 cottage on Hazelwood; architect, A. Potvin, 26 St. James St.

The millwork for $11,000 residence being built on Ballantyne Ave., is being done by Sterling Manufacturing Co., St. Lambert, Que. Balance of trades to be let shortly.

Messrs. Bonnel Bros., 341 Guy St., are the owners and builders of two residences at $14,000, on Royal Ave., N.D. G.; 2 stories, 36 x 30, frame and brick construction.

V. E. Lambert, 275 Monkland, is the owner and builder of an $8,000 residence being erected on Grey Ave., near Cote St. Antoine Rd. All work day labor by owner's staff.

Work is to start shortly on a 6 family residence being built on Beaubien, near Christophe Colomb; owner and builder, B. Despatis, 3815 Christophe Colomb.

F. Deslauriers, 700 Girouard, is the

owner and builder of an $8,000 cottage on Highland Ave.

J. H. Brouillette, 530 Old Orchard Ave., is the owner and builder of five residences corner Old Orchard and Cote St. Antoine Rd., which will cost $30,000.

L. Cloutier, 3702 Benoni St., is the owner and builder of two residences being erected on Benoni St. at a cost of $18,000; 2 stories, 25 x 48; mason, roofing and plumbing to be let balance [illegible]

Wm. Deslauriers, 460 Old Orchard, contemplates the erection of four residences on Old Orchard Ave., at a cost [illegible]

S. Cote, 39 Piedmont, contemplates the erection of four residences at a cost of $28,000, on Old Orchard Ave.

Tenders being received by the architect, Alcide Chausse, 70 St. James St., for the erection of a $10,000 cottage on Beaubien St.; no closing date set; plans and specifications with architect.

J. Gilletz & Co., 1188 City Hall, is the owner and builder of a residence on Mance, between Bernard and St. Viteur, to cost $15,000.

A. Arcand, 1006 Mt. Royal E., is the owner and builder of a $16,000 residence on Mount Royal, between Fallum and Messier; 3 stories, 24 x 50.

R. Roberts, 65 Hitchison St., is the owner and builder of an $18,000 cottage on Hazelwood; architect, H. Potvin, 26 St. Jarries St.

New Toronto, Ont.

A. Carmichael is owner and builder of 1 pair residences on 5th avenue; 2 storeys, 20 x 32, brick construction. Tenders being received by owner on electric, plumbing, heating and plastering.

Point Grey, B. C.

Work is to start at once on the erection of an $8,000 residence at 1361 Minto Crescent; 2 stories, 33 x 44, frame construction; James Borland, 177 Hastings St. E., is the owner and builder.

St. John, N. B.

John White, 100 Orange Ave., is the owner of apartments being erected at 97 Orange Ave. at a cost of $14,000.

Luther B. Smith, 38 Dufferin Rd., St. John West, is the owner and builder of 2 tenements to cost $16,000, which are being erected on Douglas Ave.

St. Catharines, Ont.

Geo. M. Elson, 74 Russell Ave., is the owner and builder of an $8,500 residence; 2 stories.

Plans have been drawn for the erection of 10 to 18 residences; 1 storey, 24 x 35; owner and builder, Allan Gogo, 9 Facer St. Owner plans to start work on 3 residences shortly.

Toronto, Ont.

Work is to start shortly on 3 residences, $10,000, to be erected on north side Sammon Ave., near Sproule St.; 3 stories, brick construction; owner and builder, J. Thorne, 317 Woodbine Ave.

R. Kelly, 14 Willard Ave., is the owner of a $9,000 residence and garage being erected on Palisades Ave. Tenders will be called shortly for electric, heating and plumbing.

Alexander Forbes, 66 Cloverlawn Ave., is the owner and builder of a pair of residences to cost $6,000 each, south side Cloverlawn, near Northcliffe; 2 stories, 22 x 34, brick construction.

Geo. E. Winters, 208 Seaton St., is the owner and builder of four residences to cost $5,000 each, southwest corner Snowden and Hilda Aves., 2 stories, 21 x 34 each; brick construction.

Messrs. Moore & Costlin, 38 Keystone Ave., are the owners and builders of three pair residences, $5,000 a pair, being erected on north side Gerrard east, near Norton Rd.; 2 stories, 35 x 22, brick construction.

Adam Copeland, 231 Milverton Boulevard, is the owner and builder of three pair of residences, $6,000 a pair, on west side Woodfield Road near Applegrove; 2 stories, 32 x 36; brick and shingle construction.

T. B. Branson, 74 Aldwich Ave., is the owner and builder of a pair of residences at $8,000, north west corner Gerrard east and Morton; 2 stories, shingle and brick construction.

A. Nelson, 7 Evans Ave., is the owner and builder of two residences and garages, $8,000 each, west side Brummell, near Baby Point Road; 2 stories, 24 x 34, brick construction.

A. Goddard, 375 Durie St., is the owner and builder of 3 bungalows, $4,500 each, east side Humbercrest Boulevard, near St. Johns Road; 1 storey and basement, 21 x 32, brick construction.

S. Yudkowitz, 166 Bathurst St., is the owner and builder of 1 pair residences, $10,000, being erected on south side Soudan Ave., near Mt. Pleasant Road; 2 stories, 32 x 36, brick construction.

Messrs. Woodhouse & Dickinson, 109 Moscow Ave., are the owners and builders of a pair of $8,000 residences on the north side of Milverton Boulevard; 2 stories, 32 x 38, shingle and brick construction.

Saunders Bros., 880 Greenwood Ave., are the owners and builders of 1 pair of residences to cost $8,000, at 1207-9 Woodbine Ave.; 2 stories, shingle and brick construction.

Geo. T. Death, Lansing P.O., Ont., is the owner and builder of a pair of $5,000 residences, north side Keewatin Ave., near Mt. Pleasant Road; 2 stories, 32 x 36.

Excavating has started for 2 pair residences, $12,000. east side Kingswood Rd., near Swanwick avenue; owner and builder is F. H. Johnston, 83 Woodington avenue. He will also start work this year on 2 pair residences, $7,000 a pair, in the same district.

Foundations are now in for two residences on west side Evans Ave., near Ardagh Ave., to cost $10,000 each; 2 stories, 24 x 34, brick construction. Wm. Richardson, 275 Armadale Ave., is the owner and employs regular staff.

Jas. W. Stoneman, 81 Miller Ave., is owner and builder of three residences being erected on Blackthorne Ave.. 2 stories, brick construction. Tenders being received on electric, painting, plastering, heating and plumbing.

Excavating is to start soon for a $12,000 residence on west side Turner Road, near Hillcrest drive; 2 stories, 26 x 36, brick construction. The owner is W. M. Maltby, 1254 St. Clair Ave. W.

Duplex Homes Co. is the owner and builder of 2 duplex residences at $12,000 each, north west corner Pacific and Bloor St.; 2 stories, brick construction.

Geo. F. Skipper, 67 Pine Crescent, is the owner and builder of 10 stores and apartments, $5,000 each, corner Jones Ave. and Queen St.; 2 stories, 20 x 50; brick construction.

J. W. McMullen, 86 Ardagh Ave., is the owner and builder of a $7,500 residence corner Beresford and McGregor; 2 stories.

Coldwell & Kent, 51 Beachview Ave., are the owners and builders of a $7,200 residence on south side Beachview Crescent; 2 stories, 35 x 22, brick construction.

J. L. Beattie, 62 Charles St., is the owner and builder of a $7,500 residence being built on east side Lauder, near Rogers Road; 2 stories.

Foundations are now in for 1 pair residences, $7,000, being built on north side Strathmore Boulevard, near Woodmount Ave.; 2 stories, 32 x 36; owner and builder, W. N. Cross, 96 Glenmount Ave.

Mrs. Agnes Williamson, 1285 Gerrard St. E., is the owner of 1 pair residences, $6,000, being erected at 30-2 Highfield Ave.; 2 stories, 32 x 36.

Verdun, Que.

H. Daoust, 61 Second Ave., is the owner and builder of a $9,000 residence on First Ave.; 3 stories, 32½ x 40. tenders wanted at once on roofing, electric, plumbing, plastering, painting and brickwork trades.

Plans are being completed and tenders called shortly, for the erection of a residence and 3 stores on Wellington St.; 3 stories, 50 x 100, solid brick construction; architect, J. E. A. Benoit, 1200 Wellington St.

Windsor, Ont.

Albert Tourangeau is owner and general contractor of $8,000 residence being erected on Giles Boulevard; 1 storey, 24 x 36. All sub trades to be let.

CONTRACTS AWARDED

Burlington, Ont.

C. Chewter, 273 East Ave. North, Hamilton, has received the plastering contract in connection with $10,000 residence being erected near Brant House.

Edmonton, Alta.

The Permanent Construction Co. Ltd., have the general contract for the erection of a $9,000 residence to be erected at 10248 Connaught Drive; 1½ stories, 27 x 31; owner J. W. Winn, Canada Life Insurance Co., Edmonton, Alta.

Montreal, Que.

The following sub-trades have been let in connection with $9,000 residence being erected at 48 St. Matthew St.; general contractor, Reid Bros.; millwork, F. Tremblay & Co.; roofing, Richardson, Simard & Co.; electric, R. S. Muir & Co.; plastering, C. Hamward; tiling, J. H. Dodgson.

M. Simard, 1346 St. Valier St., is the owner and builder of a $5,000 residence near 1346 St. Valier St.. 2 stories, 20 x 45; roofing and plumbing, H. Corbeil; plastering, J. Leville.

J. B. Martineau, 471 Orleans, is the general contractor for stores and residences being built on Ontario, near Dorion St.; masonry work—Mr. Paquin, care general contractor; plumbing, J. J. Briand; plastering—O. Morin.

The following sub-trades have been let in connection with 2 residences being erected on Fifth Ave., near Rosemount Boulevard: roofing, plumbing, and heating, J. E. Hardy; electric, O. Tardif; plastering, Jos. Menard. Brickwork and painting by day labor

The following trades have been let for 2 residences being erected on Old Orchard Ave., near Monkland: brickwork, Paquin & Perras; roofing, D. Kochenburger, 2739 St. Hubert St.; electric, Mr. Martel, care owner, S. Cote, 39 Piedmont; plumbing, Mr. Gendron, Ville St. Pierre; plastering, J. D. Nantel; painting, G. Samson.

Chouinard & Otis, 138 Valois St., are doing the roofing and plumbing in connection with 2 residences being erected on Laurier, near St. Dominique. mason, electric and plastering to be let; painting by day labor.

Contract for the erection of a $10,000 residence on Ballantyne Ave. has been awarded to Thos. Gray Construction Co., general contractor, who will buy all materials.

The following sub-trades have been let in connection with $11,000 residence being erected on Des Erables between Marie Anne and Mount Royal: brickwork, C. H. Cote, general contractors; roofing, Bernier, Fils, care general contractor; electric, Mr. Raymond, care general contractor; plumbing and heating, Perriers & Freres; plastering, W. Gauthier; painting, A. Raymond & Co.

Reid Bros., 2a Tower St., are the general contractors for $28,000 residence being erected on St. Catherine Road; contract for painting has been awarded to Thos. Lister, care of owner, J. A. Yates, 759 Hartland Ave.

The following sub-trades have been let in connection with residence and tenements being erected corner Roy, St. Andre and St. Christophe Streets: brickwork, Mr. Monette, 32 St. Louis St.; roofing, plumbing and heating, N. Oulette & Fils; electric, Charrette & Freres; plastering, F. Beaudoin & Fils.

The following trades have been let in connection with $11,000 residence being erected on Voluntaire St.: general contractor, F. Deslauriers; brickwork, Mr. Tranchemontagne; roofing, A. Lalonde; plumbing and heating, Mr. Gagnon, care general contractor; plastering, A. Leger, Ville St. Pierre; painting, J. W. Desforges; tiling, H. Capra.

L. Boisjoli, 958 St. Elie street, is doing the roofing and plumbing for $12,000 residence being built on Chateaubriand street.

J. A. Desgrosiellers, 1513 Wellington street, is owner and builder of 2 residences to cost $10,000 on Berville street; 3 storeys. 18 x 44, frame and brick construction. Electrical work—S. Quesnel, 309 Church avenue; plastering—Aubertin & Cie., 739 Lasalle road.

A. Leclaire, 120 Leclaire Ave., is the general contractor for $9,000 residence being erected on Leclaire, between Adam and St. Catherine Sts.; owner J. Joly, 99 Leclaire; 3 stories, 24 x 42.

V. D. Decarie, 332 N.D.G. Ave., is the owner of a $9,000 residence being erected on West Broadway, between Sherbrooke and Terrebonne; 2 stories, 30 x 49; general contractor, Wm. Deslauriers, 469 Old Orchard Ave.; brickwork, Jos. Faille & Co.; roofing, Mr. Cohen, care of general contractor; electric, J. S. Drummond, 467 Old Orchard; plumbing and heating, O. Mongrain, 148 Champugny; plastering, Mr. Benoit, care owner.

Outremont, Que.

The following have contracts in connection with 4 residences being erected on Willowdale Ave., to cost $24,000: brickwork and concrete, J. Young; roofing, Richardson, Simard & Co.; electric, R. S. Muir & Co.. plumbing and heating, J. Colford; plastering, Z. Bouchard; painting, H. W. Boon; tiling, Emile Lepage.

Trimming the interior is being done to residences being erected on Dollard Ave.; general contractor—L. Carta; roofing, plumbing and heating—J. St. Armand; electric— E. Choquette; plastering—Mr. Lamourex, St. Laurent; painting, Mr. Robitaille, St. Laurent; tiling—Dussard, Joly & Mongeon; brickwork—day labor by general contractor.

Plastering is to start on residence, flats and garage being built on corner Outremont and Durerger Aves.; Marcil & Gadbois are the general contractors; brickwork—C. Frenette. roofing, plumbing and heating—J. J. Briard; electric—D. A. Beaulieu; plastering, Mr. Galarnier, Villeray St.; tiling—Dussard, Joly & Mongeon.

Oshawa, Ont.

The walls are now going up for ten residences being built on Arthur St., at $3,000 each; 2 stories, 23 x 26; owner and general contractor, Gale & Trick Co.; electric, Purdy Bros.; plumbing, F. Sharrard; heating, Mr. Lockwood; plastering, H. Sutcliffe; painting, W. Stacey, all of Oshawa, Ont.

The following trades have been let in connection with 19 residences being erected on Clark St., at $4,000 each: plastering, S. Jackson; electric, C. DeGuerre; plumbing and heating, Miller & Libby; painting, W. Stacey.

Point Grey, B. C.

Smellie & Gallagher, North Vancouver, B. C., are the general contractors for residence being erected at 1137—32nd Ave. W., to cost $7,000; 1½ stories, 25 x 40.

Prince Rupert, B. C.

Work is to start at once on $16,500 nurses' home adjoining General Hospital. Jack McKechine, Prince Rupert, B. C., is the general contractor.

Rimouski, Que.

Zenon Ouellet has the contract for erection of residence costing $12,000 for J. A. Brillant; architect, Pierre Lecesque, 115 St. John St., Quebec, Que.

St. Catharines, One.

The foundations are now for $20,000 residence being erected at 21 Yate St. for H. Taylor, 30 Yate St.; 2 stories, brick and stucco construction; sheet metal, heating and plumbing—J. Peart; painting—Leach & Jones.

Toronto, Ont.

The following sub-trades have been let on $7,500 residence being built on north side Riverdale avenue, near Carlaw: electrical work, Wm. Gibson, care owner and builder, Geo. Slightman, 51 Coleman avenue; plumbing—W. J. Stratton, 314 Lee avenue; heating, Howard Furnace Co., 881 Yonge street; plastering and painting trades to be let.

G. W. Dale, 82 Arundel Ave., is the owner and builder of 1 pair and 1 single residence, $12,000, 56-8-60 Poulton Ave.; 2 stories, shingle and brick construction; masonry work, J. Murray, 537 Poulton Ave.

Hector R. McLean, 1205 St. Clair W., is the owner of a residence being erected at 30-32 St. Clair Gardens; 2 stories, 22 x 34, brick construction. E. R. Machon, 53 Boon Ave., is the builder.

Walkerville, Ont.

The walls are now going up for $18,000 residence on Nanohoe St.; Prince Bros. are the general contractors; plumbing and heating—J. L. Seiver, London St. W.

Westmount, Que.

J. H. Scott, 578 Roslyn Ave., is owner of residence and garage being erected at a cost of $22,000 on east side Grosvenor Ave., general contractor, C. J. Brown Ltd.; roofing, G. W. Reed & Co.; electric, .W E. Booth; plastering, Gerard & Gerard.

The following trades have been let for 2 pair semi-detached residences being built on Lansdowne Ave.: roofing—D. Nicholson & Co.; electric—Mr. Houle, care general contractor, Pick & Sheppard; millwork is being done by the general contractor.

Chas. J. Brown & Son, 4263 St. Catherine St. W., are the owners and builders of four semi-detached residences on Thornhill Ave The following sub-trades have been let: roofing, Campbell Gilday; electric, H. R. Cassidy; plumbing, M. J. Quigley; plastering, Gerard & Gerard.

Winnipeg, Man.

J. Keegan, 1115 Portage Ave., Winnipeg, is the general contractor for residence being erected west side Montrose, between Academy and Ores, to cost $9,500; 2 stories, 35 x 40; owner, J. Zink, Montrose Street, Winnipeg.

Power Plants, Electricity and Telephones

Abitibi River, Ont.

Kerry & Chace, of Toronto, engineers for the Hollinger Consolidated Gold Mines Ltd., Timmins, Ont., are preparing specifications for a steel tower transmission line from the Island Portage power site to Timmins, approximately 80 miles. Tenders will be called shortly for transmission line.

Galt, Ont.

Messrs. C. Turnbull Co., Water St. north, are having plans prepared for the erection of a boiler house; architect, J. Evans, 30 Water St. north.

Meaford, Ont.

The Hydro Electric Power Commission contemplate building a power plant.

(Continued on page 56)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

TENDERS

For the Construction of a Bridge on St. Clair Avenue East, over the Vale of Avoca

Tenders will be received through Registered Post only, addressed to the Chairman, Board of Control, City Hall, Toronto, up to noon

Tuesday, Sept. 11th, 1923,

for the construction on St. Clair Avenue East, over the Vale of Avoca, of a new steel arch bridge, with concrete piers, abutments, floor and earth fill in approaches; and also for the removal of the bridge now crossing the same ravine, south of the site of the new bridge. The complete work will be covered by one general contract.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained upon application to Room 313, Department of Works, City Hall, on payment of twenty-five dollars ($25.00), this sum to be refunded on return of plans.

Tenderers must comply strictly with conditions of City By-law as to deposits and sureties as set out in specifications and form of tender.

The lowest or any tender not necessarily accepted.

C. ALFRED MAGUIRE, (Mayor),
32-33 Chairman, Board of Control.

DEPARTMENT OF ROADS

TENDERS

Iberville-St. Albans and St. Bruno-Roberval-St. Bruno Highways

Tenders made on forms supplied by the Department of Roads and placed under envelopes bearing the words: "Tender," followed by the name of the highway and municipality concerned, shall be received at the office of the Minister of Roads, in the city of Quebec, Government Building until twelve o'clock of the afternoon (Eastern Standard time), on

Thursday the thirtieth (30th) of August 1923,

for the construction in gravelling on the following highways: Iberville-St.-Albans in the municipality of St. Armand West, 20,038 feet; and St.-Bruno-Roberval-St.-Bruno in the municipalities of the parishes of St. Jerome, 12,644 feet, St. Henri of Taillon, 10,447 feet and Hebertville, 5,534 feet.

The Government of the Province of Quebec does not bind itself to accept any of the tenders.

QUEBEC, August 8th, 1923.

J. L. BOULANGER,
33 Deputy Minister.

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

TOWNSHIP OF MINTO

Tenders for Municipal Drains

Sealed tenders will be received by the undersigned up to noon of

Saturday, August 18th, 1923,

for the construction of Municipal Drain No. 16 in the Township of Minto, consisting of 1882 cub. yds. of excavation in open ditch and 7600 lineal feet of tile drains.

Plan, profile and specifications may be seen at the office of the undersigned, Harriston, Ont.

An accepted cheque for 5% of the amount of the contract will be required to accompany each tender and the successful tenderer will be required to furnish a Guaranty Bond for 50% of the amount of the contract. The Township of Minto will pay the premium.

The lowest or any tender not necessarily accepted.

W. D. McLELLAN,
Clerk of the Township of Minto,
32-33 Harriston, Ont.

Queen Victoria Niagara Falls Park

TENDERS

EXTENSION OF TIME

The date of receiving sealed tenders for the supplying of the following materials:-

9,400—lineal feet of 6" cast iron pipe.
12—Hydrants.
12—T's.
8—6" Stop Valves.
8—Valve Boxes.

4,500—lineal feet of 4" cast iron pipe.
5—Hydrants.
6—T's.
4—4" Stop Valves.
4—Valve Boxes.

has been extended to Friday, August 17th, 1923.

JOHN H. JACKSON, Superintendent,
Queen Victoria Park,
31-32 Niagara Falls, Ontario

TOWNSHIP OF MARKHAM

Tenders for Bridge

Sealed tenders, addressed to G. A. M. Davison, Clerk, Unionville, will be received up to

Monday, Noon, August 20th, 1923,

for the construction of a Bridge, consisting of Concrete Abutments and Steel Super-Structure in Concession 10, between lots 5 and 6.

The lowest or any tender not necessarily accepted.

GEORGE PADGETT, Reeve.
G. A. M. DAVISON, Clerk.
JAMES, PROCTOR & REDFERN, LTD.
Consulting Engineers,
33 36 Toronto St., Toronto.

Motor Trucks Wanted

Tenders will be received by the undersigned up till noon on

Monday, August 20th, 1923,

for two to six Five Ton Five Yard Dump Body Motor Trucks. Same must be either new or as good as new.

Tenderers are to name Rental Price for period of three months with an option of purchase, rental money paid to date of purchase to apply on same.

Tenderers are requested to get Tender Forms and further information at the office of the undersigned.

The lowest or any tender not necessarily accepted.

The HAMILTON & TORONTO,
SEWER PIPE CO., LIMITED,
33 Hamilton, Ontario.

Queen Victoria Niagara Falls Park

Tenders for Excavation

Sealed tenders, plainly marked, will be received by the undersigned up to 12 o'clock, noon

Friday, August 24th, 1923,

for approximately 17,000 cubic yards of Excavation on the Embankment at Queenston, Township of Stamford.

Plans and specifications may be seen and forms of tender obtained at the office of the Park Commissioners, Niagara Falls, Ont. Marked cheque for 5% of contract price must accompany each tender. The lowest or any tender not necessarily accepted.

(Sgd.)
JOHN H. JACKSON,
Superintendent,
Queen Victoria Niagara
Niagara Falls, August 10th.
33-34 Falls Park, Ont.

To Steam Fitters and Plumbers

Sealed tenders, marked "Plumbing, etc.", addressed to the undersigned, will be received at this Department until

Saturday, August 18th, 1923,

for steam heating of the Administration Building, Ontario Hospital, Whitby, steam heating and plumbing of the War Memorial Hall, Guelph, and steam heating and plumbing of the Court House, Haileybury. Plans and specifications for all works may be seen at this Department, for the Memorial Hall, also at the office of the Bursar of the Ontario Agricultural College, Guelph, and for the Court House, Haileybury, at the office of the Clerk of Public Works at Haileybury.

Each tender must be accompanied by an accepted bank cheque payable to the Honorable George S. Henry, Minister of Public Works and Highways, Ontario, for five per cent. of the tender. and the bona fide signatures and addresses of two sureties, or the name of a Guarantee Company approved by the Department, willing to provide a bond for the due fulfilment of the contract. The Department is not bound to accept the lowest or any tender.

By order,

H. F. McNAUGHTEN,
Secretary, Public Works
Department, Ontario.

Toronto, August 4th, 1923.

Newspapers publishing this without authority will not be paid for it. 33

DEPARTMENT OF RAILWAYS AND CANALS

Ontario-St. Lawrence Canals Rapide Plat Canal

Notice to Contractors

Sealed tenders, addressed to the undersigned and marked "Tender for Improving Upper Entrance to the Rapide Plat Canal" will be received at this office until 12 o'clock noon on

Thursday, August 23rd, 1923.

Plans, specifications and form of contract to be entered into can be seen on and after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer, Ontario-St. Lawrence Canals, Cornwall, Ont.

The work consists principally of Dredging and Steam Shovel Excavation.

An accepted bank cheque on a chartered bank of Canada for the sum of $14,000.00, made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work at the rate stated in the offer submitted. ,

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security or part security, for the fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

J. W. PUGSLEY,
Secretary.

Department of Railways and Canals,
Ottawa, August 11, 1923. 33

CITY OF NIAGARA FALLS

Tenders for Sewer Pipe

Tenders will be received till noon, **August 20th,** at the office of City Clerk, for supply of 1200 Lin. Ft. of No. one 18 in. Sewer Pipe, vitrified or cement, with 6 inch, 12 inch and 15 inch branches.

T. S. SCOTT,
City Manager,
Niagara Falls, Ont.

33

Village of Port Dover

Sealed tenders for a Tarvia Macadam Pavement, and Curbing and Gutter, approximately 14,000 yards pavement and 2,000 lineal feet curbing and gutter, addressed to James Sloan, Clerk of the Village of Port Dover, will be received until 5 p.m.

Monday, August 27th, 1923,

Plans and specifications may be seen at the office of the Engineer, Guy R. Marston, Courthouse, Simcoe, Ont.

Lowest or any tender not necessarily accepted.

JAMES SLOAN, Clerk,
Port Dover, Ont.

August 14, 1923. 33-34

Tenders Wanted

BOARD OF EDUCATION

Sealed tenders, addressed to the Business Administrator and Secretary-Treasurer, Board of Education, Administration Building, 155 College St., endorsed with the word "Tender" and also with the name of the school building and trade or article to which it relates will be received until

Wednesday, August 22, 1923,

for

(1) Roofing and Tinsmithing for RIVERDALE COLLEGIATE.
(2) Roofing and Tinsmithing, Painting and Glazing for CLINTON ST. SCHOOL.
(3) Marble, Tile and Terrazzo for JARVIS COLLEGIATE.
(4) Painting and Glazing and Local Phones for RUNNYMEDE SCHOOL.
(5) Hydraulic Ash Hoist for EARL HAIG SCHOOL.
(6) Oil Burning System for WINCHESTER STREET SCHOOL.
(7) Marble Work for SILVERTHORN SCHOOL.
(8) Painting for PARKDALE SCHOOL.

Specifications and conditions for tendering may be seen and all information obtained at the office of the Architect of the Board, 155 College St., Telephone Trinity 8200.

Tenders must be in the office of the Secretarial Department at the Administration Building, 155 College St., not later than 4 p.m. on the day named, after which no tender will be received.

The lowest or any tender will not necessarily be accepted.

F. E. POWELL,
Chairman Property Committee.
W. W. PEARSE,
Business Administrator and Secretary-Tresurer.
33

Position Wanted by graduate engineer. Six years' experience on power plant and pumping equipment, also selling experience Apply Box No. 356, Contract Record, Toronto. 33

TENDERS

In the matter of the estate of Michael J. Casey, trading under the firm name and style of Don Foundry Co., carrying on business in the City of Toronto, Authorized Assignor.

Tenders are invited for the purchase en bloc of the following assets of the above named company.

Stock in Trade, Plant and Machinery, Building and Leasehold Rights, Replacement Value $5,285.00.

All the said Assets are located at Keating St., Toronto, and may be inspected on appointment with the undersigned.

All tenders must be in the hands of the Authorized Trustee, on or before noon of the **20th day of August, 1923.**

The highest tender will be accepted.

Terms of payment 10% cash with tender, balance in cash on closing.

Dated at Toronto, this 8th day of August, 1923.

GEORGE. A. STEPHENSON,
702 Federal Bldg.,
Richmond and Sheppard Streets, Toronto.
33 Authorized Trustee.

For Sale

Half million hard wire cut face or backing brick, for immediate delivery. Box 323, Contract Record, Toronto. 30-33

For Sale

1 Sawyer Massey Road Grader.
1—50 ton bin and screen, with elevator and buckets.
1—London paver.

Box 291, Contract Record, Toronto. 30 t.f.

STEEL PILING

Bought and Sold

Universal Equipment Company

28-t.f. Niagara Falls

FOR SALE

3 Drum Lidgerwood Hoist 65′ Boom. 8″ x 8″ Compressor and Motor on Trucks. 12 x 16 Crusher. 6 cu. ft. Gasoline Mixer. Also other equipment. J. G. Sipprell, Box 495, Halifax, N.S. 33-36

FOR SALE

1—6 cu. ft. capacity Wettlaufer Mixer, on trucks with Fairbanks-Morse Gasoline Engine and power side loader $200.00
1—10 cu. ft. capacity Wettlaufer Mixer, on trucks with 5 H.P. Gasoline engine and power side loader $400.00

Above machines have been thoroughly overhauled, repainted and are in good operating condition.

K. W. LEWIS,
105 Front St. E.,
Toronto, Ont.

33-34

Manager wanted to take charge of gravel business at bed. Good opportunity for man who has a small capital to invest in the business. Apply Box 101, Chatham, Ont. .33-34

Some One Wants to Buy

The equipment or machinery that you are not using.

It may be occupying valuable space in your yard or shop, collecting dust, rust and hard knocks.

Sell it before "Depreciation" scraps it.

Use the **Tender & Proposals Department.** It helps others, let it help you.

Power Plants, Electricity and Telephones

([illegible] page 53)

Negotiations are being made for the purchase of the insolvent Georgian Bay Power & Milling Co., to which extensive alterations may be made.

Nelson, B. C.

Work is to start at once on power line from Nelson to Ainsworth, to Florence Mine, at a cost of $60,000.

Port Haney, B. C.

Work is to start at once building a $10,000 telephone exchange; 1½ stories, [illegible] frame construction.

Point Du Bois, Man.

The time for receiving tenders for alternators has been extended till September 4. Specifications and form of tender with Hydro-electric System, 55 Princess street, Winnipeg, Man.

Winnipeg, Man.

Tenders will be received by the city clerk, C. J. Brown, till September 4 for travelling crane for stand-by plant. Specifications and form of tender with Hydro-electric System, 55 Princess street, Winnipeg, Man.

Tenders will be received by the Hydro-electric System till August 20, for the erection of a stand-by plant, 65 ft. high, 100 x 150, concrete foundation, steel cage, brick and tile construction.

CONTRACTS AWARDED

Bagotville, Que.

The town council has awarded the contract for hydro power plant equipment to Albert Forton, general contractor, Bagotville, Que., at $125,000; no materials purchased; engineer, J. F. Grenon, Chicoutimi, Que.

Peterborough, Ont.

The foundations are in for $50,000 electrical distributing station. General contractor, V. C. Hayes. Steel is being supplied by the Hamilton Steel and Iron Co. Ltd.

Swift Current, Sask.

Fraser & Chalmers of Canada, Limited, Montreal, Que., have received an order from the Corporation of Swift Current, for a 700 gallon centrifugal pump direct connected to a 67 kv.a. synchronous motor, together with necessary starting equipment and control panels.

Toronto, Ont.

Messrs. W. E. Dillon & Co. Limited, have received the roofing contract for the addition to Junction sub-station corner Edwin St. and Ruskin Ave., for the Toronto Electric Commissioners.

Winnipeg, Man.

The city of Winnipeg has awarded the contract for furnace and oil firing equipment to the Combustion Engineering Corporation, subject to approval of council.

Contract for de-aerating open heater $11,575, for stand-by plant, has been awarded to Canadian Allis Chalmers Co., Winnipeg, subject to approval of council.

The contract for structural steel in connection with $31,880 steam stand-by plant has been awarded to Dominion Bridge Co., for 267 tons of steel at $5.97 per lb.

Miscellaneous

Burlington, Ont.

The town council has awarded the contract for reinforced concrete retaining wall at a cost of $8,752 to H. C. Curtiss, general contractor, Burlington.

Kirkland Lake & Swastika, Ont.

Work has been started on sewers and waterworks system, to cost $60,000.

Ottawa, Ont.

The City Council contemplate the purchase of the following equipment; 1 truck & hoist $250; 1 continental axle stand $60; various tools for garage, wrenches &c. $100; 1,000′ Stetzel concrete sidewalk forms, estimated cost $2,000; power hammer for workshop, estimated cost $1,900; cement gun $2,000.

St. Davids, Ont.

Queenston Quarries Ltd., contemplate quarry extension which will increase capacity of present plant and add machinery for stone quarrying and cutting.

Shawinigan Falls, P. Q.

The city manager, J. H. Valiquette, is in the market for a carload of alum in lumps for filter plant. Specifications are desired, with approximate date of delivery.

Fires

Quebec, P. Q.

Fire recently destroyed warehouse at Champlain Market Square, owned by J. Adhemar Gagnon, 72 Ste. Ursule St. Loss to building and contents, $55,000. Will probably rebuild.

Redcliff, Alta.

The power plant at Redcliff was struck by lightning recently and damaged to the extent of $15,000.

Riviere du Loup, P. Q.

Fraserville Shoe Store, owned by A. Lemieux, was destroyed by fire recently. Loss $40,000. He will probably rebuild.

Windsor, Ont.

Fire recently took place in the plant of the Canadian Roofing Manufacturing Co. Loss estimated between $50,000 and $75,000. The above company will rebuild at once.

Large Reservoir in Belfast

Reports state that the Belfast, Ireland, water commissioners have contracted for the construction of a reservoir in the Mourne Mountains, County Down, for the purpose of augmenting the present water supply of the city of Belfast. It is understood that work will be started immediately on this project and it is expected that it will be completed within six years at an approximate cost of £980,000.

Railway in Chile

According to an executive decree, as published in El Diario Official of May 18, a concession has been granted for the construction and operation of a railway from Puerto Montt (the southern terminus of the Chilean State Railways) to Puerto Toledo, situated at the junction of the Maullin and Gomez Rivers. The railroad will be of meter gauge and approximately 40 kilometers (25 miles) in length.

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Manufacturers Adopt Standard Size for Common Brick

Through the co-operation of the Division of Simplified Practice of the Department of Commerce the common brick industry has discarded a great variety of odd sizes of brick and established one standard size for the seven billion building brick produced every year in the United States. This size is approximately 8 x 3¾ x 2¼ in. The only exception now to be allowed is in the case of smooth-faced brick for special exterior use, in which a slight variation in one dimension only is permissible.

The common brick industry established the standard size some years ago, but experienced trouble because its standard was not insisted upon for public work and by many architects. With the U. S. government now definitely supporting the industry in its efforts to standardize its product it is expected that before long all specifications will call for standard sized brick, to the great benefit not only of the brick industry but to all users of its product.

Novel High-Pressure Steam Boiler

Mr. Viktor Plomqvist, a Swedish engineer, has recently patented, according to "Compressed Air," a high-pressure boiler named the "Atmos." It is of novel design—its chief characteristic being that the steam is generated in rotating elements which are fed with boiling water from a stationary heater.

There is a system of tubes rotating at great speed, which has the effect of keeping the inner surfaces continuously covered with boiling water unmixed with steam—the steam being liberated later—whereby the generating tubes are always effectively protected. It is possible to generate steam at a pressure up to 150 atmospheres, 2,200 pounds, or higher without injury to the rotating system. A saving of 20 per cent. in fuel is claimed; and the boiler is also lighter and takes up less space than the familiar types.

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Sandwich, Ont. August 13th, 1923. 33-34

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In 1917, Professor Talbot, of the University of Illinois, took samples of rail steel bars from the Western Newspaper Union Building which was being wrecked at that time. Tests on these bars showed an everage elastic limit of 63,000 lbs. per square inch.

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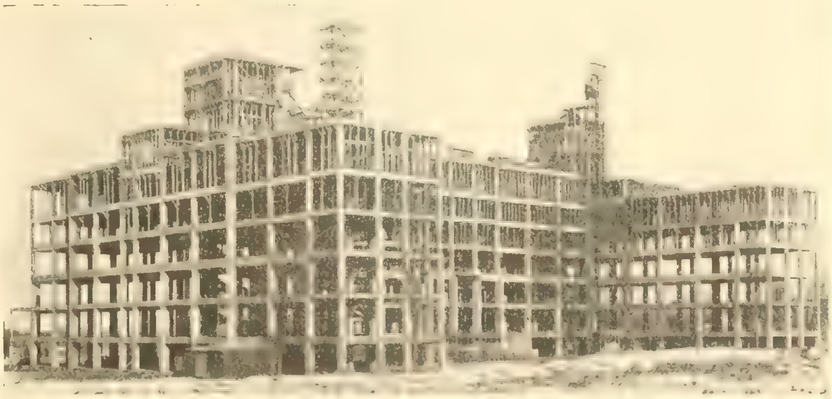

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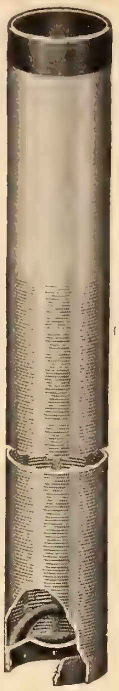

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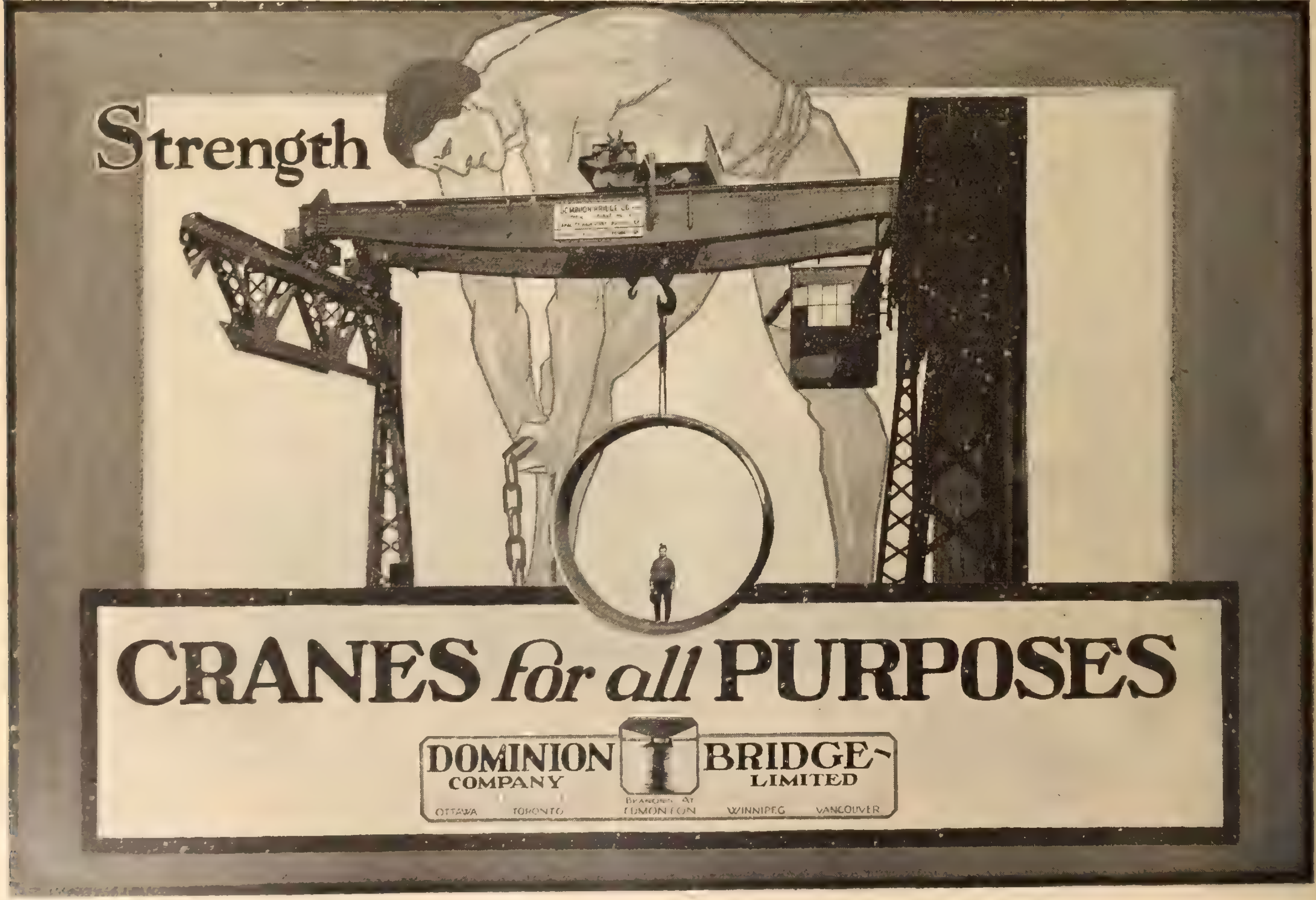
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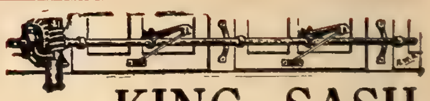

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Car lots, including bags	per bbl.	3.60	3.48	4.20	3.45
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	10.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	25.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*'	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M	21.00	16.50*	19.00	25.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M	29.00	25.00	32.00	
Enamelled brick	per M.	125 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
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Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base	4.00 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	3.40 "	4.50 "	5.10 base	
Hoops	per 100 lbs.	5.00 "	5.00 "		
Twisted and deformed bars	per 100 lbs.	3.90 "	4.00 "	4.55	4.00
Angles, channels and tees under 3 in.	per 100 lbs.	4.00 "	4.00 "	5.35	6.00
Structural shapes	per 100 lbs.	3.90 "	4.25 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.15	6.25
Plates—3/16 in.	per 100 lbs.	4.40 "	4.25 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.50 "	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.50 "	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65 "	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00 "	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 "	6.00 "	7.00 base	
Cast iron pipe	per ton	65.00 "	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.45	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.80.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.

Do Big Executives Really Read Their Business Papers?

The success of the great business publications of this, or any other country, is entirely due to the fact that big business men **do** read and **do** eagerly follow the progress of their particular industry, or profession, as reflected in their business newspaper.

Labour disputes, industrial trials and merchandising problems can be discussed by business newspapers in a manner not possible in a publication reaching the general public.

Advertisers can point out to the readers of business newspapers, **technical** points of extreme sales value that would hurt sales if advertised in a medium available to the public.

"Every issue in the last quarter century has been of the greatest value to me in my buisness."
—Merchant Rating $200,000.00

"The information regarding Electric Power Plants is extremely interesting and instructive."
—Prominent City Engineer.

"We wish to compliment you very highly on the subject matter which you have included in this issue."
—$5,000,000 Manufacturer

--- and ten thousand more!

CURRENT PRICES OF BUILDING AND ENGINEERING MATERIALS—continued

Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	94.50	65.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	45.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	135.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	145.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.25	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	70.00
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	15.00	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	14.50
Putty in bulk	per cwt.	5.95	4.25	5.50	6.50
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.38	1.40	1.26	1.56
Raw linseed oil, in bbls.	per gal.	1.35	1.38	1.23	1.53
Turpentine, in bbls.	per gal.	1.60	2.20	2.50	2.80
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	26.00
Plaster of paris, in bbl. lots	per bbl.	5.50	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50
LABOR:—					
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.25	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers (Common)	per hr.	.40–.50	.30	47½–.55	.50–.56¼
Laborers (Skilled)	per hr.	.60-.70			.90
Sheet Metal Workers	per hr.	.80			

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

PLASTER *Including bags.

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Structural Steel for Bridges and Buildings

Quick Service on Standard Plans

Warehouse Stock of All Kinds for Quick Shipment

HEAD OFFICE: SARNIA, ONTARIO. Phones 1340 and 1341

Service

Because we have the plant, the men, the experience—we can supply your requirements in cut stone and marble on shortest notice.

No order too large, no order too small to receive the same prompt, careful attention.

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SAND & GRAVEL CO. LTD.

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WASHED CONCRETE SAND
CONCRETE PRODUCTS

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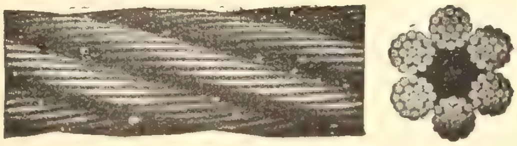
Phones: Office, Adel. 4936 Nights, Ger. 4049M

Wire Rope and Fittings



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We fabricate Iron Work for builders. Send us your specifications.

Canada Wire & Iron Goods Co. HAMILTON

Wire rope stocks carried in Montreal, Calgary and Edmonton
Agents: J. H. Hanson, Co. Ltd., Montreal
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THE HAGERSVILLE CRUSHED STONE Co.

Crushed stone from our quarries is hard and durable, giving lasting service with least upkeep costs. Does not deteriorate with exposure to weather and does not cost any more than softer stone. Approximate weight 2400 lbs. to cubic yard, which means a big saving in freight over gravel products.

Capacity of Plant: 25 Cars Per Day

Prompt shipment. Delivery on all steam and electric railways. Your orders solicited.

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For All Purposes

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LEON GELINAS, Man. Director Main 8046

Do You Want Crushed Stone?

That is Clean, Tough Stone of a Quality suitable for Macadam Road and Concrete. We can supply you in any size or quantity. Our Service is unexcelled and our prices right.

Phone or write us for quotations when you are in the market

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G. W. Essery, Mgr.

Where can I get the best quality

CLEAN SILICA SAND

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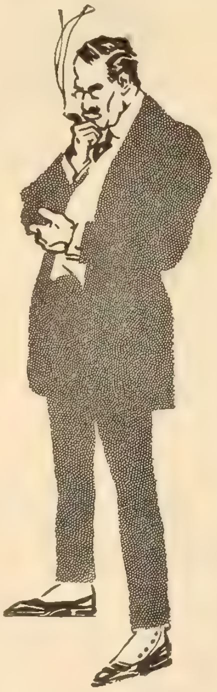
Settle this question once and for all by investigating the merits of our sand.

Get your requirements of
Sand screened and washed
When you need it and as
Wanted in any quantities
Delivered on the job.



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Yard: Bathurst St. Dock Toronto
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Orders promptly executed

Queenston Quarries Ltd.
St. Davids Ont.

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STANDARD LIME COMPANY
LIMITED

JOLIETTE, QUE.
LARGEST PRODUCERS OF LIME IN CANADA

PLANTS

CRUSHED STONE	LIME	SAND
JOLIETTE, QUE.	JOLLIETTE and ST. MARC, QUE.	ST. FELIX DE VALOIS, QUE.
C.N.R. & C.P.R.	C.N.R. & C.P.R.	C.P.R.

Largest and Best Equipped Plant in Ontario

As evidence of our desire to give customers the highest grade product and the best service, we have installed the most modern equipment known to the industry.

A daily output of 3500 tons is being achieved and the stone, all sizes, comes clean and even in size.

Write, wire or phone your orders for quick action

Canada Crushed Stone Corporation Limited

DUNDAS ONTARIO

Exclusive Agents:—John E. Russell Co., Ltd. **Phone Adelaide 1600**

CRUSHED STONE

Hagersville Stone for Concrete and Macadam Roads

Long experience in road building has taught most contractors the superiority of stone from the Hagersville Quarries. With recognition of its quality came steadily increasing orders, to meet which we have recently enlarged our crusher plant to more than double its former capacity. The best service is thus assured to those who order now. Let us quote.

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Quarries—Hagersville, Ont.
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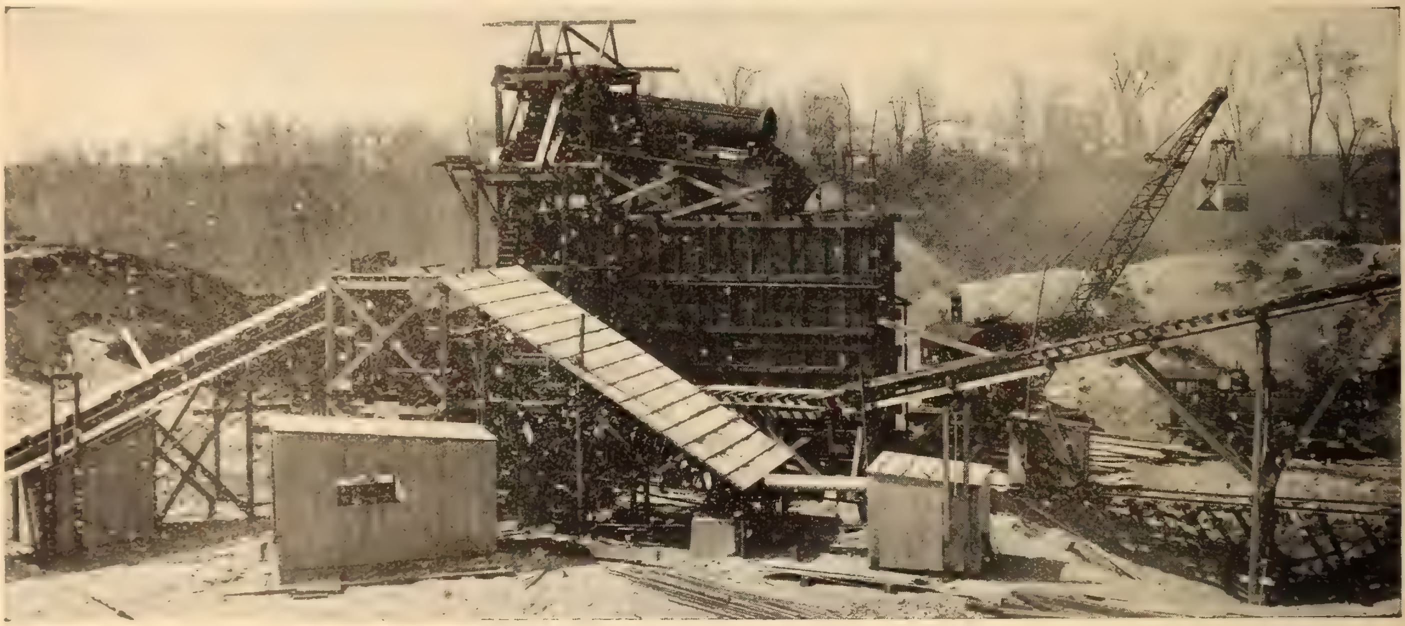
(Rough, Dressed and Pulverized)

Our Plant is equipped with the most modern machinery,
enabling us to fill the largest orders without delay

Specialty: Pulverized Stone Dust Filler for Asphalt Paving Purposes

DESCHAMBAULT QUARRY CORPORATION

Head Office: QUEBEC, P. Q. **Works: ST. MARC, Portneuf Co.**



Sand
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Gravel

Enlarged facilities and new methods for crushing, screening and washing, enable us to supply the trade with the highest grade products at any time. Write, wire or phone your order for prompt attention.

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Co. Limited
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Rapid Truck Delivery. Just Phone
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ALLEN BROTHERS
STOP 19, KINGSTON ROAD
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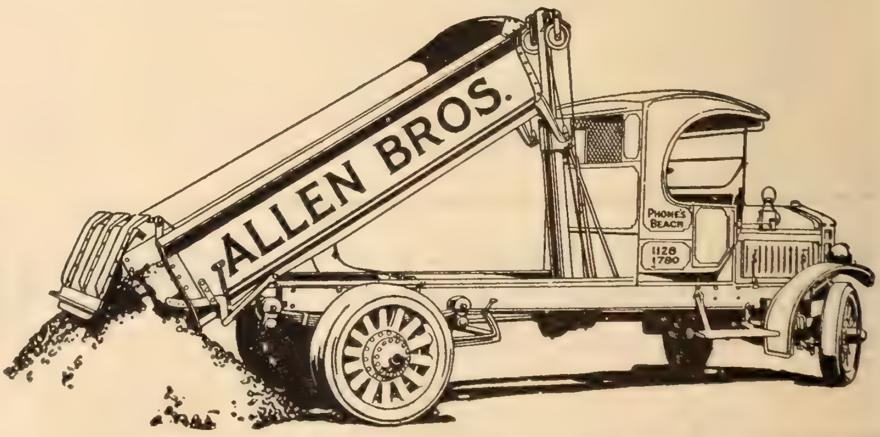

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What materials will you use?

"Empire Brand" Hardwood flooring will insure it being a first class job, satisfactory to yourself and the customer. We can supply it in Maple, Birch, and Plain and Quarter Cut Oak.

Quick Delivery

J. R. Eaton & Sons Limited
ORILLIA — ONTARIO

STANDARD
Lamp Cord and Portable Cord

stand for superior quality both of materials and workmanship at prices which, durability considered, mean greatest economy.

Write our nearest office for prices.

Standard Underground Cable Co.
of Canada, Limited
Branch Offices and Warehouses
Montreal, Hamilton, Toronto, Winnipeg, Seattle
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ENAMELED BRICK FOR EXTERIORS

For exteriors there is nothing more attractive than our Enameled Brick in Mottled effects which we can furnish in endless variety, or plain white can also be used to advantage.

Year after year buildings faced with our product are cleaned by the simple and inexpensive process of washing down with caustic soda and water.

Five or twenty years after erection a building so cleaned is to all outward appearances a new structure.

Our Quality is unexcelled. Our prices most reasonable.

For thirty years our product has given universal satisfaction for exteriors—interiors—courts.

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Manufacturers of Enameled and Fire Brick,
Dealers in Face Brick of all Colors and Textures.
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OSGOOD ¾-yd. H. D. Building Mountain Road

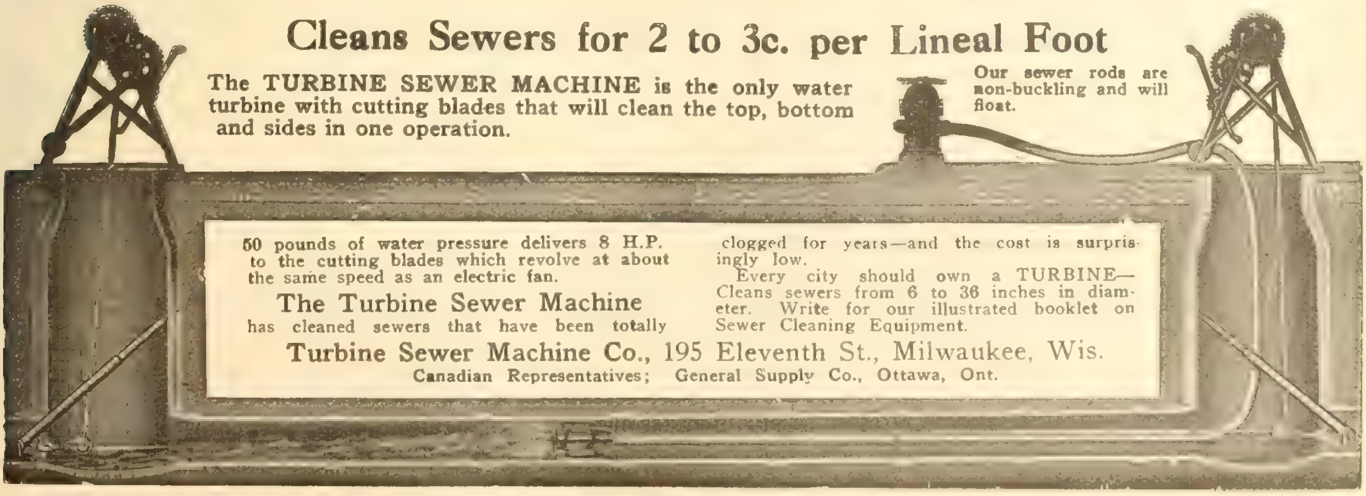
Reliability-Service-Osgood

three words of great importance to users or prospective users of Steam Shovels. Osgood Steam Shovels are built reliable—right in our own factory—to give long and satisfactory service in the field.

An Osgood can only be fully appreciated after it has been seen. Watch one at work. Our new Bulletin 231 will tell you more about them.

¾—1 and 1¼ yd. Revolving type.
Steam Shovels, Clamshells, Draglines.
1½ to 6 yd. Railroad type Steam Shovels.

The OSGOOD Company
MARION, OHIO, U. S. A.



Cleans Sewers for 2 to 3c. per Lineal Foot

The TURBINE SEWER MACHINE is the only water turbine with cutting blades that will clean the top, bottom and sides in one operation.

Our sewer rods are non-buckling and will float.

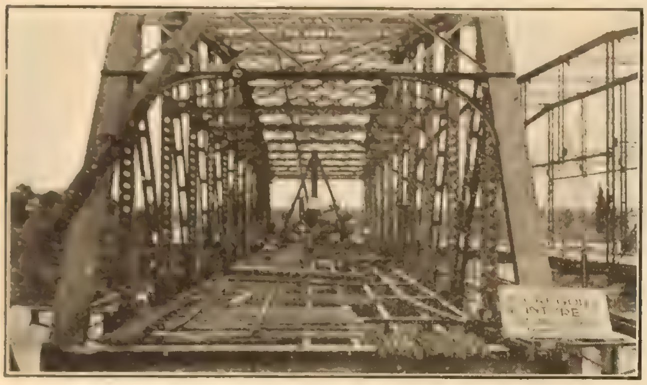
50 pounds of water pressure delivers 8 H.P. to the cutting blades which revolve at about the same speed as an electric fan.

The Turbine Sewer Machine has cleaned sewers that have been totally clogged for years—and the cost is surprisingly low.

Every city should own a TURBINE—Cleans sewers from 6 to 36 inches in diameter. Write for our illustrated booklet on Sewer Cleaning Equipment.

Turbine Sewer Machine Co., 195 Eleventh St., Milwaukee, Wis.
Canadian Representatives; General Supply Co., Ottawa, Ont.

Structural Steel AND Bridges



192′ 0″ Clear Span Highway Bridge over Thames River, North Richmond St., London, Ont. Erected 1922

We build and erect all kinds of Structural Steel Bridges, Roof Trusses, Bank and Office Railings, Stair Work, Elevator Grilles, Fire Escapes, etc.

Over 5,000 Tons in Stock of

Beams, Column Sections, Angles, Tees, Plates, Bars, Checkered Floor Plates, etc.
Annual Capacity 18,000 Tons

McGregor & McIntyre, Limited

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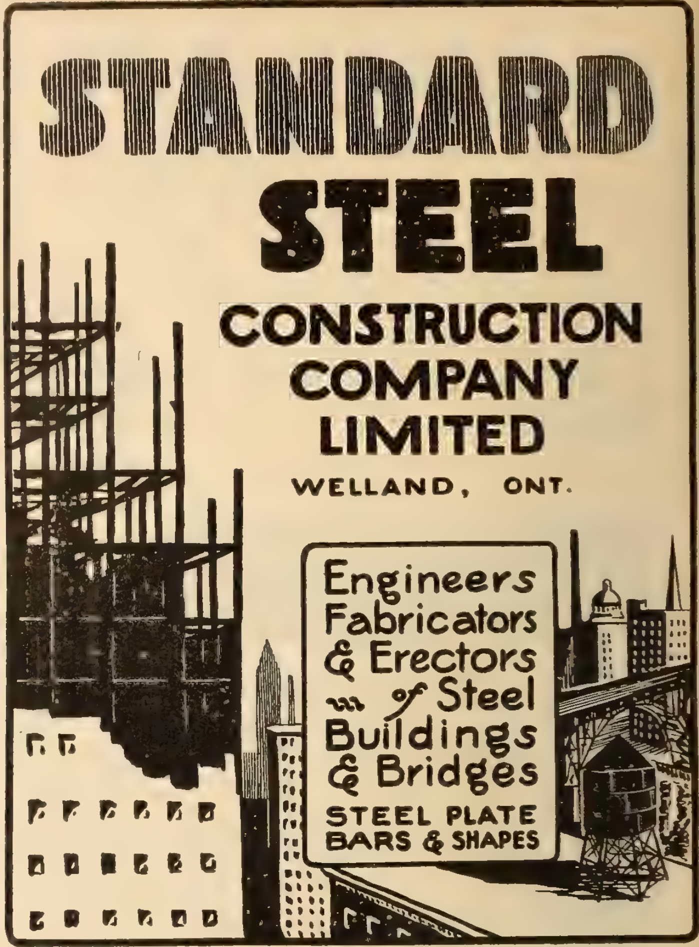

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WELLAND, ONT.

Engineers
Fabricators
& Erectors
of Steel
Buildings
& Bridges

STEEL PLATE
BARS & SHAPES

While the Trench is Open

is the time to install Venturi Meter Tubes in the pipe line, whether it is new construction or repairs and changes to old lines. Much expense and inconvenience is saved by doing the whole job at one time.

VENTURI METERS

VENTURI-Registered

should be placed in every main pipe of every water works system. Practically all large cities of the United States and Canada have accepted the above statement and adopted it as standard practice for both pumping lines and gravity mains. They realize it is just as important to meter main supply lines as to meter individual services to users. The cost of a Venturi Meter Tube is not greatly in excess of the straight pipe it replaces and the friction loss is negligible. If you contemplate new work or repairs, why not put in Venturi Meters now? You will eventually.

Send for Bulletin No. 210

Builders Iron Foundry, Providence, R. I.

Canadian Representatives:
GENERAL SUPPLY CO., OF CANADA LTD., Ottawa, Montreal, Winnipeg, Vancouver.
ALLEN GENERAL SUPPLIES LTD., Toronto, Ont.

CAST IRON PIPE

STANDARD CAST IRON PIPE
also
DeLAVAUD Centrifugal Process

All sizes in Stock
for

WATER CULVERT
GAS SEWER

Lake or Rail Shipment

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Head Office, Works and Docks TORONTO

Made in Canada
Conduit

Electric Wiring
Made Safe

Labelled under supervision of Underwriters Laboratories

XCELADUCT

(GALVANIZED)

For All
Electrical
Instal-
lations

Manufactured by
National Conduit Co., Limited
Toronto

Rails New
12, 16, 20, 25, 30, 35, 40, 60, 80, 85, 100 lb.
Splice Bar, Bolts, Spike Switches.

Rails Relaying
30, 45, 50, 52, 56, 60, 65, 70 lb.
Splice Bars, Spike, Switches.

Jno. J. Gartshore, Limited
TORONTO

One dollar per day saved on each bricklayer by using

RENFREW LIME

Because the mortar requires less tempering on the board. It will not set too quickly, and allows bricklayer to bed more bricks at a time. Bricks are easier bedded down. All these advantages helps the bricklayer to lay many more bricks each day. The mortar sets very hard. The lime will take more sand, and costs no more than other limes.

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Manufacturers: LIME, BRICK, FARM TILE.
Renfrew, Ontario

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order for

HYDRANTS,
VALVES
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VALVE
BOXES
place it with us.

MADE IN CANADA

Strong, Substantial and
Modern Designs.
Prices right.
Write for prices and see.

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VALVE AND HYDRANT MANUFACTURERS
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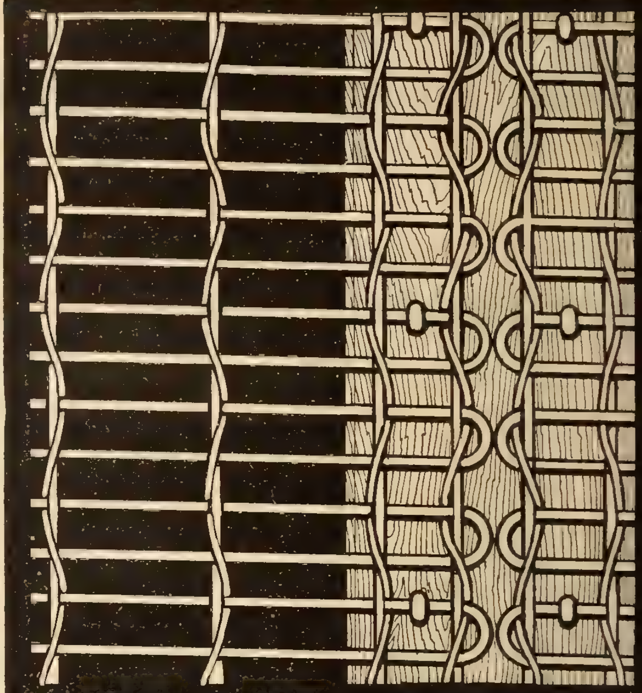

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TRUSSED
WIRE LATH

Definite Points of Superiority

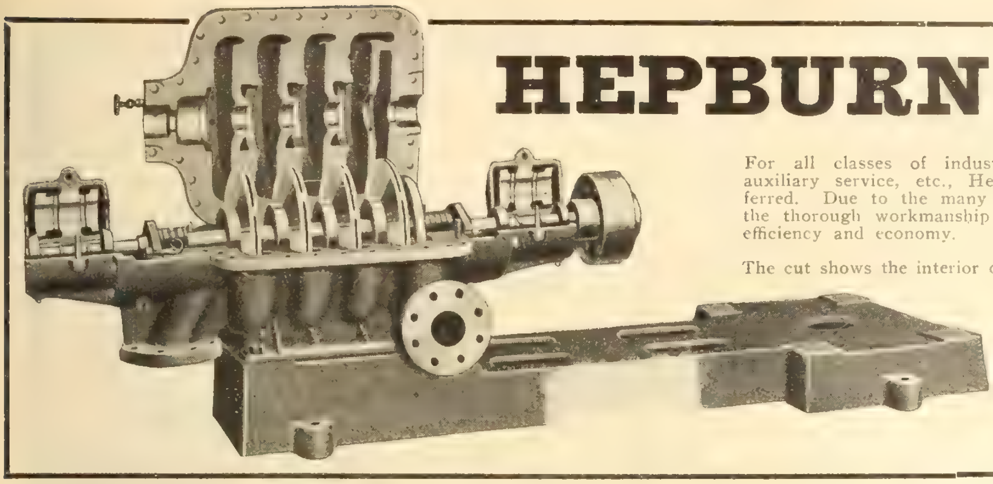
Selvedge edge prevents cutting or scratching while handling; lathers can work faster.

"Truss" construction prevents buckling when lathe is unrolled. Lays flat. Requires no lacing at edges over studs and joists. Can be placed over sheathing without furring. The truss construction raises every other wire off the joist thus providing a perfect key to the plaster even at the joists.

Thoroughly embedded in the plaster and thus absolutely protected from corrosive effects of the atmosphere. Rust does not attack the rounded wire as it does the thin edge of sheet metal fabric.

Readily bent and formed into shape with minimum cutting. Stock width 32" and 36", rolls 105′ long.

The B. Greening Wire Co., Limited
Hamilton, Ontario
Winnipeg, Man. Montreal, Que.



HEPBURN PUMPS

For all classes of industrial service, water works systems, fire auxiliary service, etc., Hepburn centrifugal pumps are to be preferred. Due to the many exclusive features in their design and to the thorough workmanship put into them, they are noted for both efficiency and economy.

The cut shows the interior of a 4-Stage Split Casing Centrifugal Pump.

John T. Hepburn
Engineers and Iron Founders
18-60 Van Horne St., Toronto

They do it with Clyde!
CLYDE
Standard Two Drum Steam Hoist

"We have five two-drum hoists of your make in use at this time and as fast as our other equipment wears out, we expect to replace it with Clydes. We are very well pleased with the performance of your machines and the service rendered by your company. JOHN FINN & SON, B. L. Bailie, Gen. Mgr."

You will find ECONOMY and DEPENDABILITY built into EVERY UNIT of the CLYDE Line

You'll take pride in your CLYDE!

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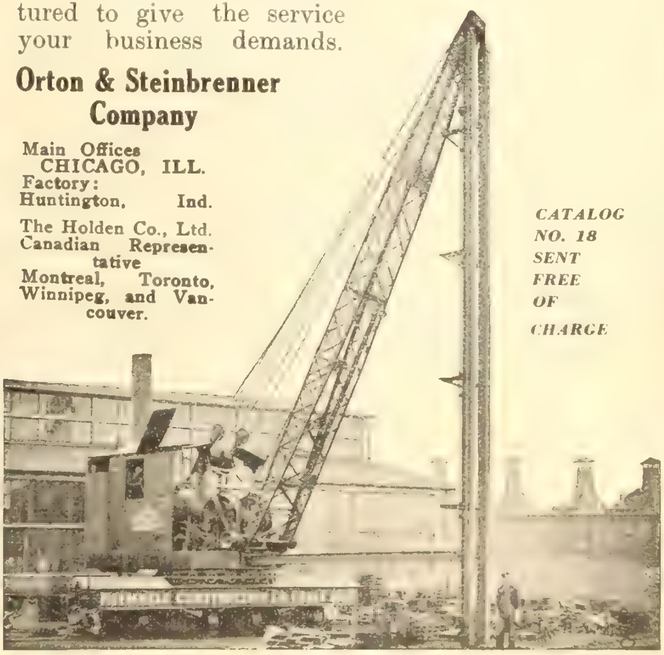
O. S. DEPENDABLE LOCOMOTIVE CRANES

Clam Shell and Orange Peel Buckets

are designed and manufactured to give the service your business demands.



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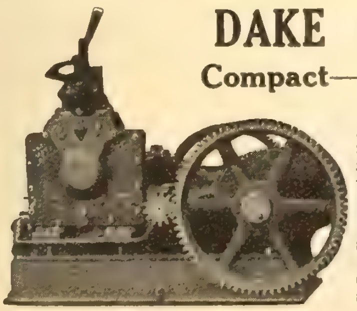
DAKE MACHINERY

Compact—Simple—Reliable



Hoists, Winches, Crabs, Motors, Fans, Blowers, Pumps, Swingers, Marine Machinery etc., etc. Air, Steam or Electric to suit your convenience.
Let us quote you on your requirements. Send for our Big Catalogue of Dake Machinery. Let our Engineers assist you in your mechanical problems.

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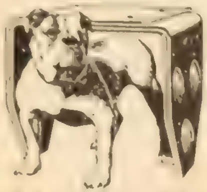
Capt. Wm. Stitt, Can. Sales Mgr.

By its long reach, a SAUERMAN DRAGLINE CABLEWAY EXCAVATOR is enabled to dig to any depth and handle sand and gravel from the pit direct to plant without help of any auxiliary conveyor.
SAUERMAN BROS.
1143 Monadnock Blk., Chicago
Agents: F. H. Hopkins & Co. Ltd., Montreal, Toronto.

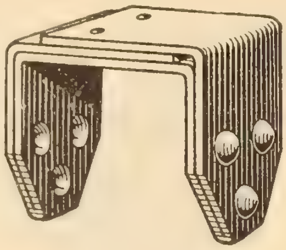
SAUERMAN DRAGLINE CABLEWAY EXCAVATORS
dig, convey, elevate and dump in one operation

BULL DOG FLOOR CLIP



Put the BULL-DOG on *your* Pay-roll

With this device it is possible to secure the advantages of wood floors in reinforced concrete buildings at an economical cost, at a vital saving of time, and with a reduction of 18,000 lbs. dead load per 1,000 sq. ft. Conceded by the leading architects and builders to be the best device of its kind and 100 per cent efficient. More than ten million sold last year on the American market.



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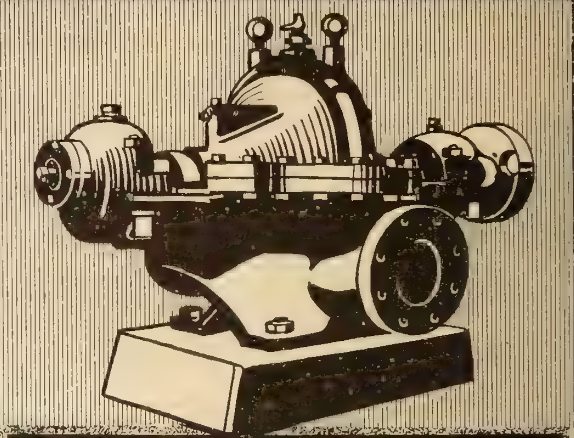

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Anything that is held by a Screw
IS HELD LONGER & STRONGER BY USING
RAWLPLUGS

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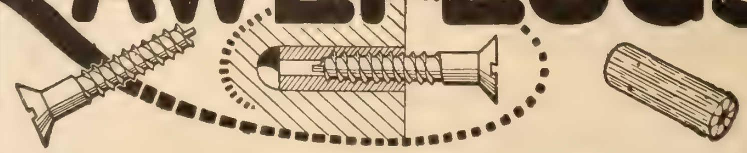

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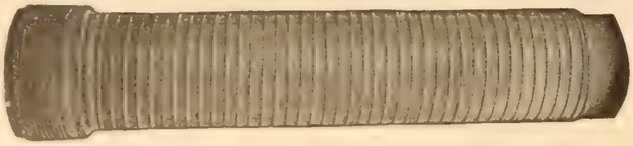

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"CAST IRON PIPE has the Greatest Resistance to Corrosion."

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We have the most complete organization for carrying out repairs by the Electric Arc Welding process, including portable machines.

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Stiffest Requirements

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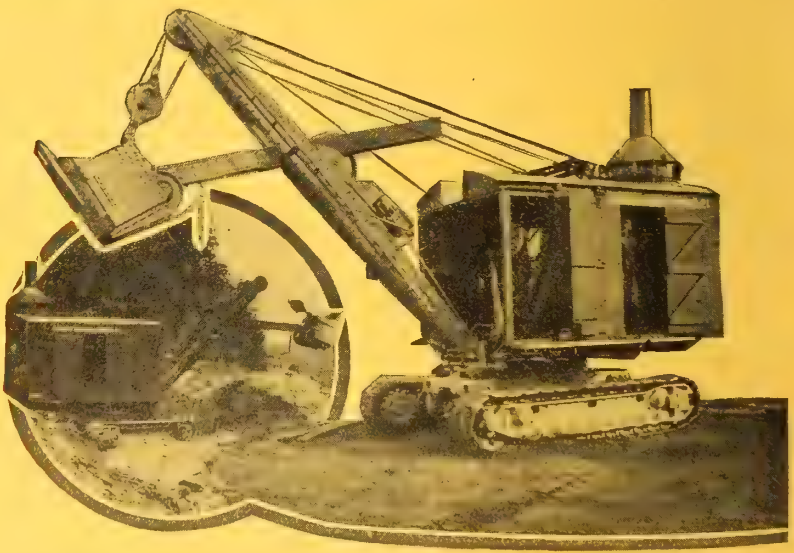
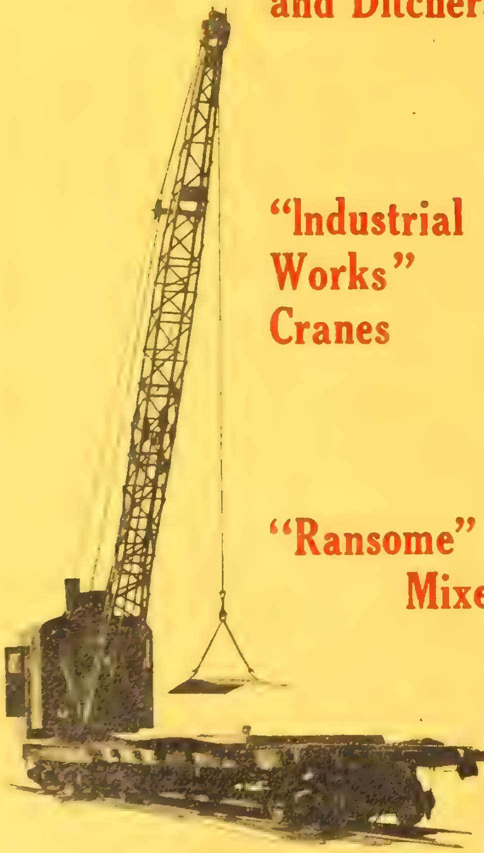
"Marion" Steam Shovels
and Ditchers





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"Ransome" Concrete
Mixers

Fast
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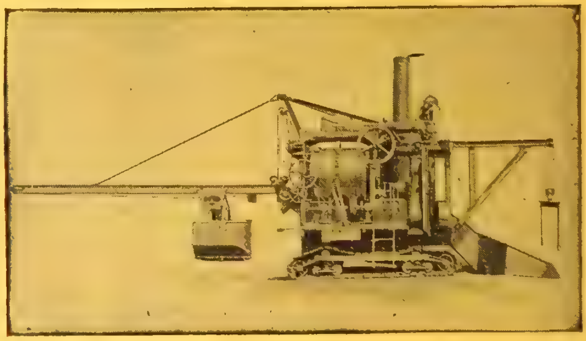
Discharge



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Vol. 37 Toronto, August 22, 1923 No. 34

Contract Record and Engineering Review

Kingston Road, Toronto, looking east to the City limits—part of the section laid by Kilmer & Barber, Limited.

KINGSTON Road, one of Toronto's eastern highway entrances, is now paved with Asphalt. Reconstruction of this thoroughfare began last Fall when new street car tracks were laid from Queen Street to the City limits. The paving of the roadway was left till this year commencing as soon as weather conditions permitted.

Toronto knows from first-hand experience extending over many years that Asphalt pavements can be laid quickly and opened to traffic immediately; that they last long and cost little to maintain; are clean, quiet and admirable for all types of traffic—qualities very necessary in cities and large towns.

IMPERIAL
Asphalt
PRODUCTS

ROAD ENGINEERING DEPARTMENT
Imperial Oil Limited
Toronto Canada

Kingston Road, Toronto, looking east to Main Street—part of the section laid by the City Works Department.

Alphabetical Index to Advertisers Page 16 Classified Directory to Advertisements Page 6

A view of our 36″ Continuous Stave

Wood Pipe

in the famous Capilano Pipe Line which, after serving Vancouver City faithfully for over 15 years, is still in its infancy.

C. S. Pipe
is used successfully for hydro-electric purposes up to 14 ft in diameter.

TANKS
and SILOS to Order
Any Size—Any Style

CONTINUOUS STAVE
Wood Pipe
or WIRE WOUND

YOU CAN NO LONGER RECKON WITHOUT WOOD PIPE

We have enthusiastic customers willing to assure you that recent improvements have so increased efficiency and durability as to place **Wood Pipe** on a plane with Cast Iron. These features at a low initial cost, combined with ease of transportation and installation, spell true **Economy.**

When writing for information and prices please specify diameter and pressure

Our Electric-Butt-Welded
STEEL
DOUBLE COUPLING
with Inside Ring
Galvanized

has entirely eliminated joint leaks and has perfected **WIRE WOUND PIPE**

Canadian Pipe Company, Ltd.

550 Pacific St., VANCOUVER, B. C.

Proud of their Work

Men engaged in excavating sewer trenches and laying sewer pipe are often classed as unskilled labourers. But every experienced sewer engineer and sewer contractor knows that such is far from the case, and they appreciate the skill of men that can dig a straight trench and lay the pipes true to line and grade.

The men who laid the sewer in Belleville, Ontario, illustrated herewith, are proud of their work, and Mr. Charles D. Campbell, the City Engineer, did not hesitate to secure the photograph from which the illustration has been made.

Vitrified Clay Pipe laid and jointed properly is "laid to stay." Indifferent pipe laying may easily reduce the value of a sewer by one half, and when the money that a community invests in sewers is considered, the value of good workmanship should be appreciated.

Vitrified Clay Pipe provides a permanent and indestructible conduit for conveying water or sewage of any character.

It is not affected by alkali or acid; it will not incrustate, disintegrate or corrode.

In justice to the material it should be properly laid and jointed, and carefully covered, and if this is done there will be no interruption of service, no breaking up of roads or pavements and no replacements required.

SPECIFY AND USE VITRIFIED CLAY PIPE AND "LAY TO STAY"

Vitrified Clay Pipe Publicity Bureau

Toronto, Ont. **St. Johns, P.Q.** **New Glasgow, N.S.**

Water-bound Macadam Surfaced with Domtar – Ottawa Suburban Roads Commission

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If Not Use Domtar

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Lumsden equipment includes a fleet of trucks which may be rented singly or as unit.

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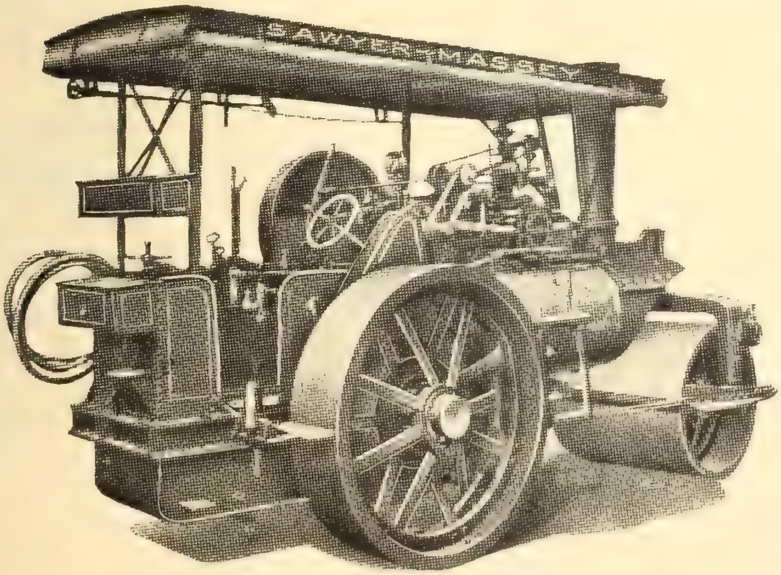
IF EXPERIENCE IS AN ASSET you are ASSURED of the benefit of it in any ROAD MAKING MACHINERY you purchase from the SAWYER-MASSEY COMPANY



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- Drying Apparatus
  - Canadian Blower & Forge Co.
  - Sturtevant, B. F. & Co

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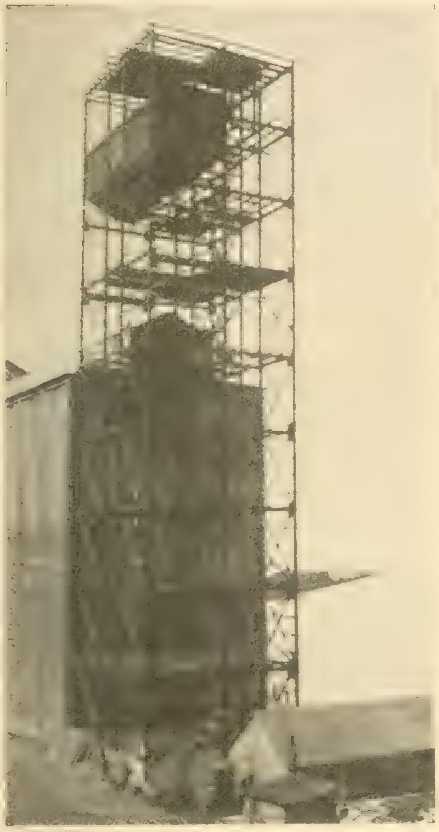

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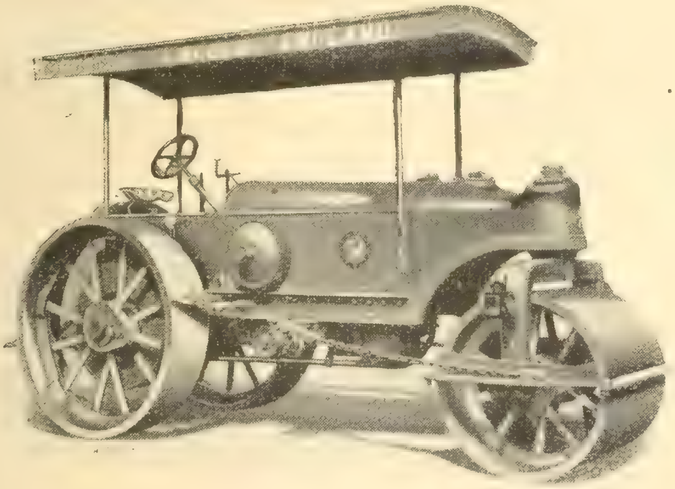
We carry a large stock of Structural Shapes and plates and can make prompt shipment on orders for plain material.



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Instant Reversing without changing Gears.

No Smoke.

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Three Travelling Speeds in either direction.

Easy to handle.

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RUSTON & HORNSBY LTD.
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(Continued on page 10)

If Your Contract Calls for Rock Drills

Use Ingersoll-Rand Portable Compressors and "Jackhamers"

You cannot keep moving your rock work back to the stationary compressor plant. Of course, air lines and hose can be lengthened as the work progresses, but every foot you add increases the labor and material costs and also the power losses, due to air leakage and pipe friction.

With Ingersoll-Rand Portable Compressors—

The entire compressor plant can be moved with the one-man "Jackhamer" drills, compressing your air where you use it. The compressor is always near the drill runners, saving power costs and eliminating erection and dismantling charges.

An Ingersoll-Rand Portable Compressor is a complete plant—Air Compressor, Gasoline Engine (or electric motor) Receiver, Fuel Tank and Cooling System are all mounted on a strong steel frame ready for instant haulage.

Gasoline Engine Driven 91, 160, 250 cu. ft. capacity.

Electric Motor Driven 91, 160, 260 cu. ft. capacity.

Let us send you copies of Bulletins 3315 and 4146-C. Also booklet "Compressed Air for the Road Builder."

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Drills Drill Steel, Drill Steel Sharpeners, Pneumatic Tools

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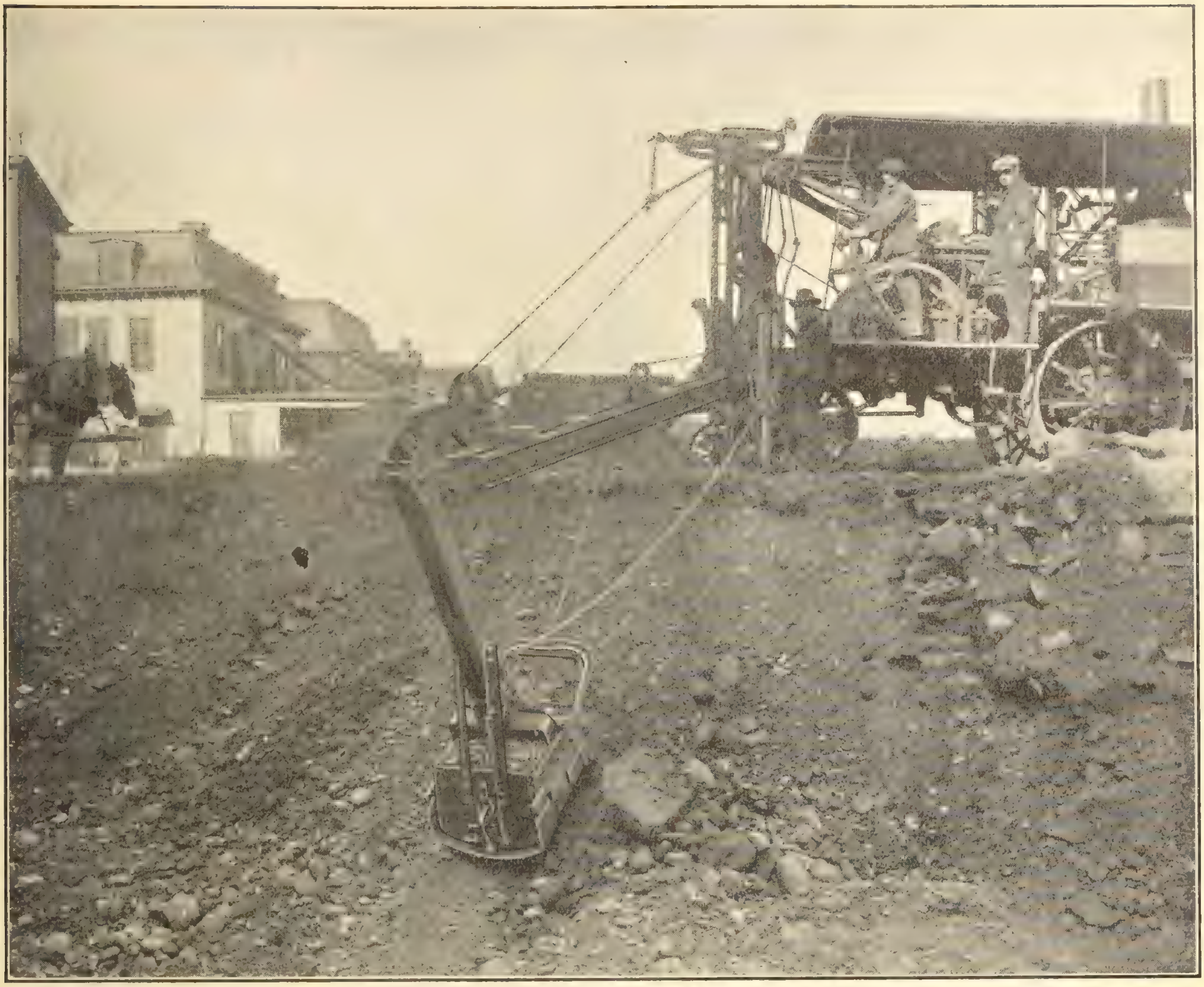


Here's a pretty fair Demonstration of the Keystone Excavator's Work

Here you see a Keystone using the Ditcher Scoop and Stick, clawing out heavy, boulder strewn soil at a 200 yd. per day clip. Note the action of the Scoop—works towards the machine, which stays on the ground level, and backs up, taking the excavation with it as it goes. No time lost getting the Keystone into or out of a deep hole and no need for teams or trucks to struggle into or out of that same hole to be loaded.

The Keystone doesn't swing to dump the scoopful either, just the boom does this, which means very accurate dumping, also enabling the Keystone to operate in a narrow space.

Here's a picture that shows "punch", speed and economy. Three men make an ample team. The sturdy 32 h.p. engine gives all the power needed. The Boom and Stick dig down to 18 feet and can finish a job without hand shovelling.

Of course—there are other Scoops for other duties, such as road grading, side hill excavation, etc. And all this at a mighty attractive made-in-Canada price for the Excavator and Scoops.

Let us send you our latest Booklet and proposition.

Engineering & Machine Works of Canada, Ltd.

ST. CATHARINES, ONT.

Eastern Sales Offices: Hall Machinery Co., Sherbrooke, Que. and Birks Bldg., Montreal.
Winnipeg Agents: Powell Equipment Company, Limited. Vancouver Agents: M. Grindley Co.

An Exhibit You Will Not Want To Miss—

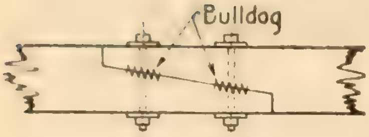
We invite you to visit our exhibit at the Canadian National Exhibition. It is located near the northwest corner of Machinery Hall. We will be glad to explain to you the value of Midwest Products, and demonstrate some of their applications.

Midwest Bulldogs

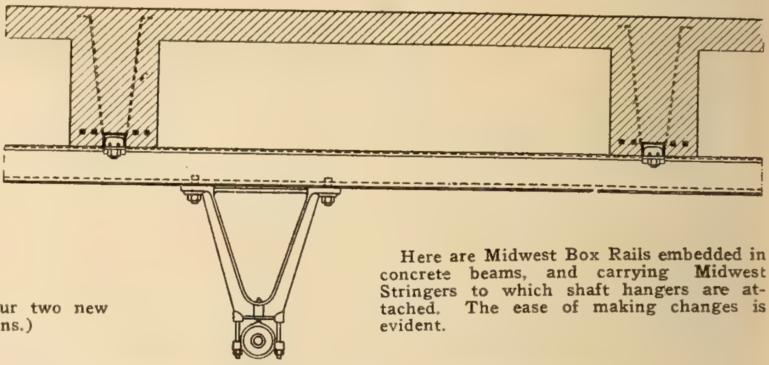
are special cold rolled steel plates, used to make a stronger, quicker and cheaper timber joint on any kind of wooden construction They are in extensive use all over the world on piers, bridges, silos, buildings, trestles, trusses, mine timbers, etc., etc.

Midwest Steel Sections

are used to fasten side wall, overhead and floor equipment in place on brick, steel, wooden or concrete structures. Box Rails act as reinforcements in concrete structures as well. These sections allow for installation, re-location and expansion of fixtures and equipment, a bolt wrench being the only tool required.



This timber joint is only one of hundreds on which Bulldogs can be used. A Bulldog joint requires no dowels, drift pins, keys or wedges. Less labor, and less materials are required. Ordinary workmen can make a strong, firm joint.

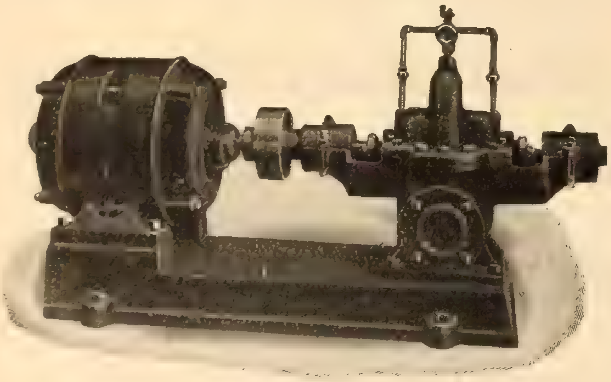


Here are Midwest Box Rails embedded in concrete beams, and carrying Midwest Stringers to which shaft hangers are attached. The ease of making changes is evident.

If you cannot attend the Exhibition, write for our two new catalogs: BD-3 (for Bulldogs) and S-10 (for Sections.)

MIDWEST CANADA LIMITED

83 Craig St. West **Montreal, Que.**



W 243

An improved type of horizontally split-shell centrifugal

Fall Improvements

Only the latest improved pump is good enough when a new pump is needed.

Smart-Turner Split-Shell Centrifugal Pumps

meet your every requirement—they are very sturdy and carefully machined.

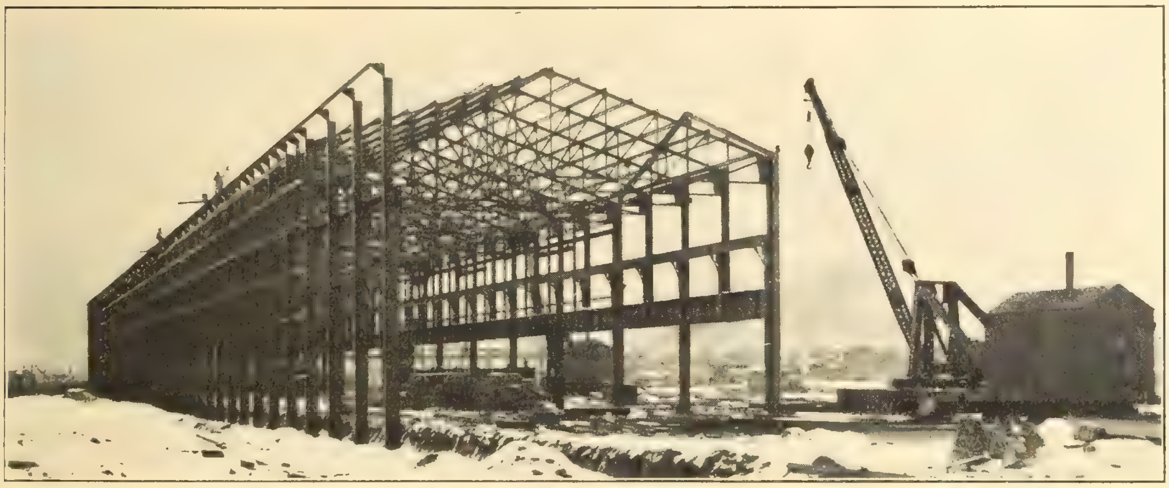
Fisher Steam Specialties
Order from us

The
SMART-TURNER MACHINE COMPANY, LIMITED
Hamilton, Ontario

Representatives in Toronto, Montreal, Winnipeg and St. John

BUILD IN THE WINTER
with
Structural Steel

IT PAYS!



Structural Steel is particularly well adapted to winter construction as indicated by the rapid progress of erection of the new Ford Building at Ford, Ont.

The machine shop which is 1088 feet long by 570 feet wide was commenced on November 15th, 1922 and all steel completed by May 25th, 1923. The building contains 5100 tons of structural steel.

Build with
STRUCTURAL STEEL

Issued by the
Structural Steel Association

NEPTUNE
The Pioneer of Progress

TRIDENT COMPOUND

This is the ideal meter for use on variable-demand lines because it registers accurately the peak as well as the off-hour flow. The Trident Compound is designed and built as a single unit and operates as such, eliminating the difficulties and troubles which accompany the coupling of two individual meters under one housing. The increased revenue this meter brings in will pay for its initial cost in a short time.

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Neptune Meter Company, Limited

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STONE - SAND - GRAVEL

Prompt Delivery

Rogers Supply Company Limited

Toronto, Canada

Adel. 4318 Adel. 6900

Equal to Every Emergency

Severe operating conditions emphasize the difference between the "Caterpillar"* Tractor and every other machine or method. "Caterpillar" performance, dependability, economy and service are endorsed by leading contractors and engineers in Canada as well as throughout the World.

H. N. Rodgers & Co., prominent contractors, say:

"We are very glad to advise you at this time of the satisfactory performance of the "Caterpillar" tractors which we have operated under severe conditions in contracting work. We have three 10-tons and are glad to say these tractors have met every demand made on them for power, traction and continuous hard work.

For all classes of contracting work, we prefer the Holt "Caterpillar" because we have found it equal to every emergency, economical to operate and to maintain and particularly because of the very prompt and liberal service which we have received. The matter of prompt and adequate service is most important to the contractor and we have found Holt service to be unequalled and at all times satisfactory to us."

The "Caterpillar" excels in every field where power and endurance are demanded: logging, mining, freighting, snow removal and public works of every kind.

**There is but one "Caterpillar"—Holt builds it*

CANADIAN HOLT COMPANY, *Limited*
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Without a Diving Suit

Not Even Hip Boots

They didn't need them. The Thew did the job in a matter of fact manner, as if wading the Cumberland were an every day duty.

The shovel stepped right along, its treads clinging to the slippery, yielding bottom. The Thew Power Steer made it easy for the operator to handle it without leaving the cab and no one had to get down in the water to hook up any special mechanism.

Because it out-digs the ordinary shovel on any job and meets just such emergencies as this without fuss or worry, the Thew fully justifies the confidence that owners and operators have in it.

After all these men are the best witnesses. Read what some of them have to say in Folder 523, out this month. Write for your copy if you miss it.

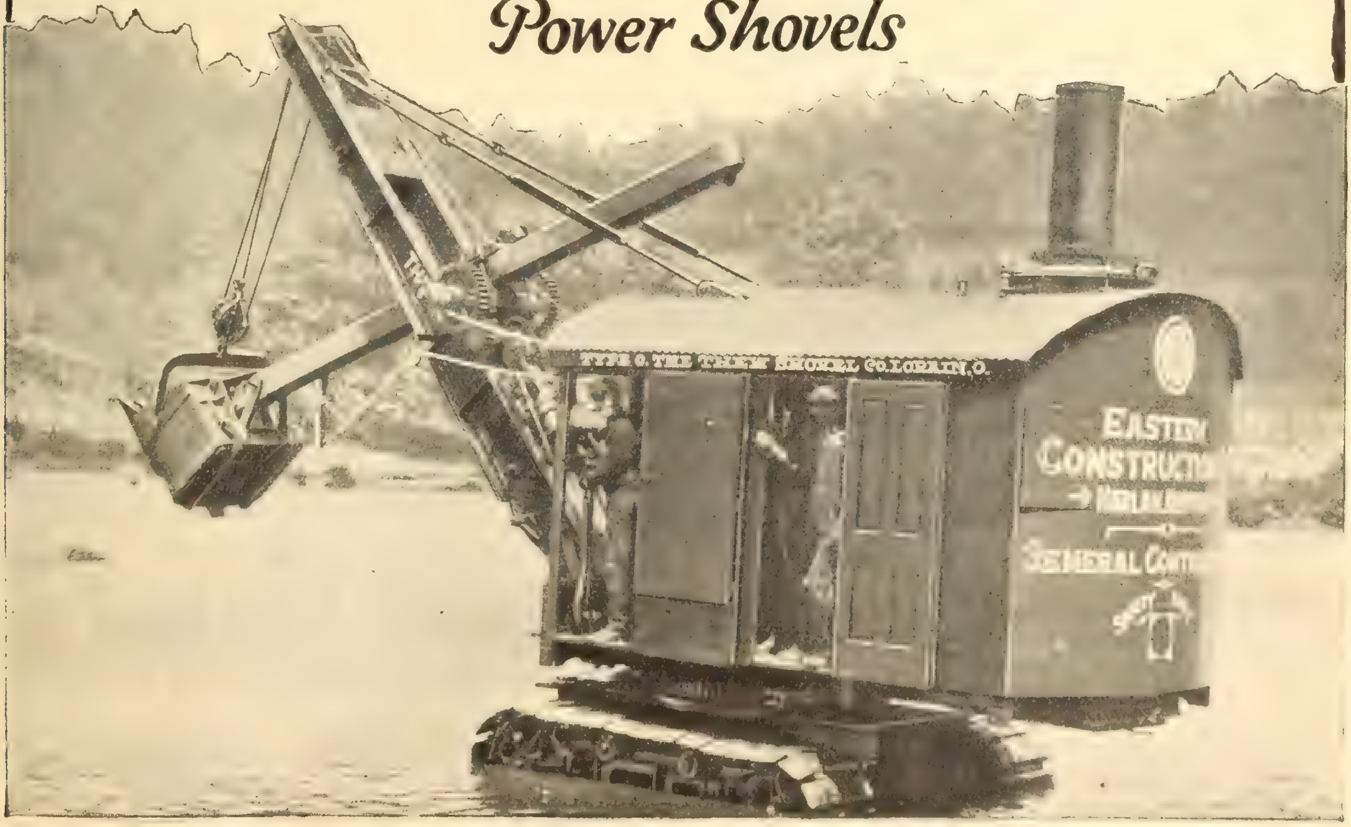
THE THEW SHOVEL COMPANY, LORAIN, OHIO

THE WILSON EQUIPMENT COMPANY,
Toronto, Canada.
GORMAN'S, LIMITED,
Calgary, Edmonton, Canada.

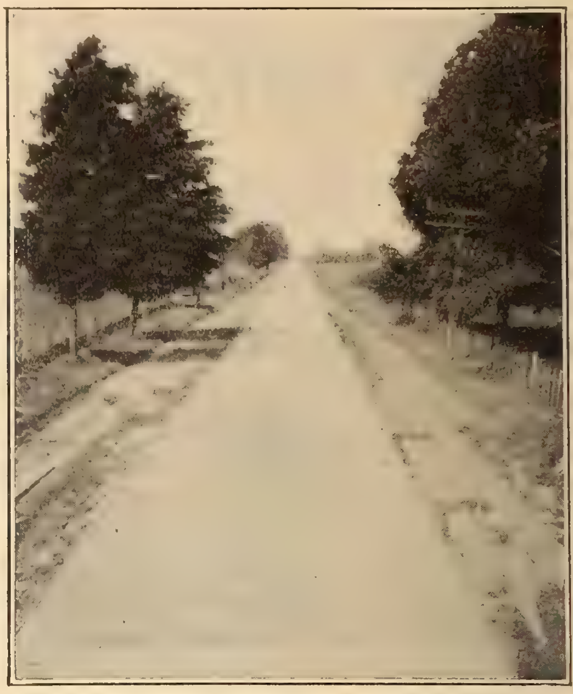
T. M. GRINDLEY COMPANY,
1158 Homer St., Vancouver, B. C.
THE EASTERN EQUIPMENT COMPANY
Dorval, Quebec, Canada.

Thew

Power Shovels



Part of Longueuil, Chambly Road, Que.



Concrete pavement on 16th sideroad Chatham Township, Ont.

Modern Highways For Modern Traffic

The determination of the people to have roads equal to the traffic they bear, has led to a yearly increase in the yardage of Concrete Paving constructed in Canada.

But the construction of Concrete roads even to-day, is not keeping pace with the output of motor vehicles. The motor truck has revolutionized road traffic—has created a positive need for Concrete Highways.

The country's requirements call for an even greater speeding up of Canada's modern road building programme.

Highway traffic continues to increase; the tonnage of loads constantly grows, emphasizing the importance of fuel saving, skid-proof, really enduring pavements such as Concrete supplies.

Concrete roads lighten the taxpayer's burden by practically eliminating upkeep. The lower haulage costs benefit both farmer and consumer. The even surface invites tourist trade and promotes the comfort and well-being of every user.

Literature on Concrete Roads will be gladly sent to any reader interested.

Specify
CANADA CEMENT
Uniformly Reliable

CANADA CEMENT CONCRETE FOR PERMANENCE

We maintain a Service Department to co-operate in all lines of work for which Concrete is adapted. Our library is comprehensive and is at your disposal at all times without charge.

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Sales Offices at **Montreal** **Toronto** **Winnipeg** **Calgary**

Stores Yonge & Bedford Park
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Owners and Builders
Weismiller & Mackenzie Bros., Ltd.

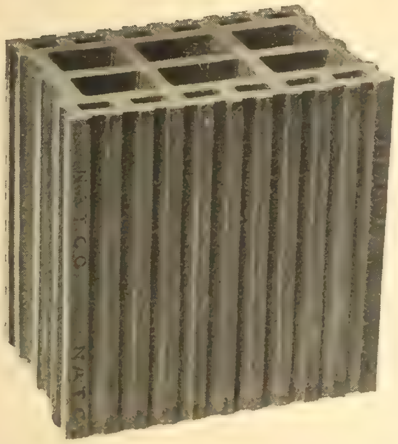
An excellent example of the strong trend towards building groups of stores of

NATCO · HOLLOW · TILE

—a construction policy that adds greatly to investment value through the greater desirability, safety and permanence of the buildings.

The saving of from 10 to 20% over other masonry construction and the speed of erection are also features that recommend

NATCO



New 8" NATCO Multicell Tile Unit showing dovetail method for gripping stucco on exterior and plaster on interior.

NATIONAL·FIRE·PROOFING·COMPANY
OF CANADA, LIMITED

Factory: Hamilton, Ont. : : **Dominion Bank Building, TORONTO**

MUSSENS M LIMITED

Do You Use Curb, Curb and Gutter or Sidewalk Forms?

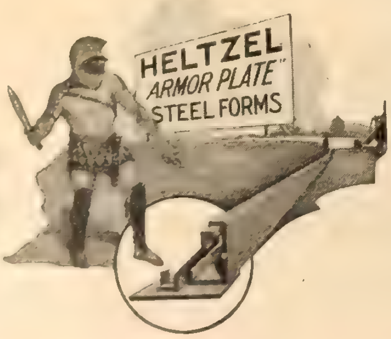
Regardless of the type of concrete paving job you are handling—straight or battered curb, integral curb and base, curb and gutter or sidewalk—there's a Heltzel Form just suited to your need.

You will want Heltzel Steel Forms because they are set quicker—with less trouble, and hold their line more rigidly than any other steel form manufactured.

Write today for bulletins on Heltzel Curb and Gutter and Sidewalk Forms. Compare them with any other type—and *you will buy Heltzel Forms.*

The Heltzel Steel Form & Iron Company - Warren, Ohio

Manufacturers of steel forms for sidewalk, curb, curb and gutter, integral curb and base and concrete road



Our Sole Canadian Representatives:

Mussens Limited	Mussens Limited,	Mussens Limited,	Mussens Limited,
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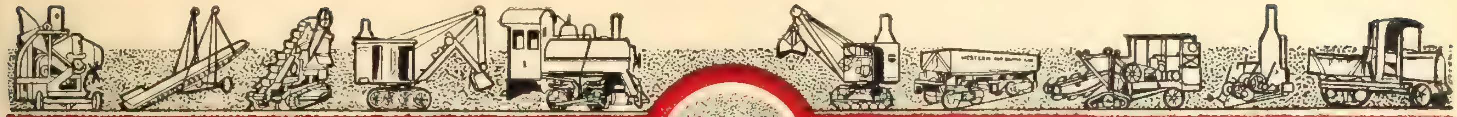


MUSSENS M LIMITED

Burch Stone Spreaders

THE
FIRST
MILE
PAYS THE
COST—

AFTER THAT

BURCH STONE SPREADERS

ARE MONEY-MAKERS

Spreads to any depth or to any width from 8 to 16 ft.

With combinations any width from 8 feet to 32 feet.

MADE IN CANADA

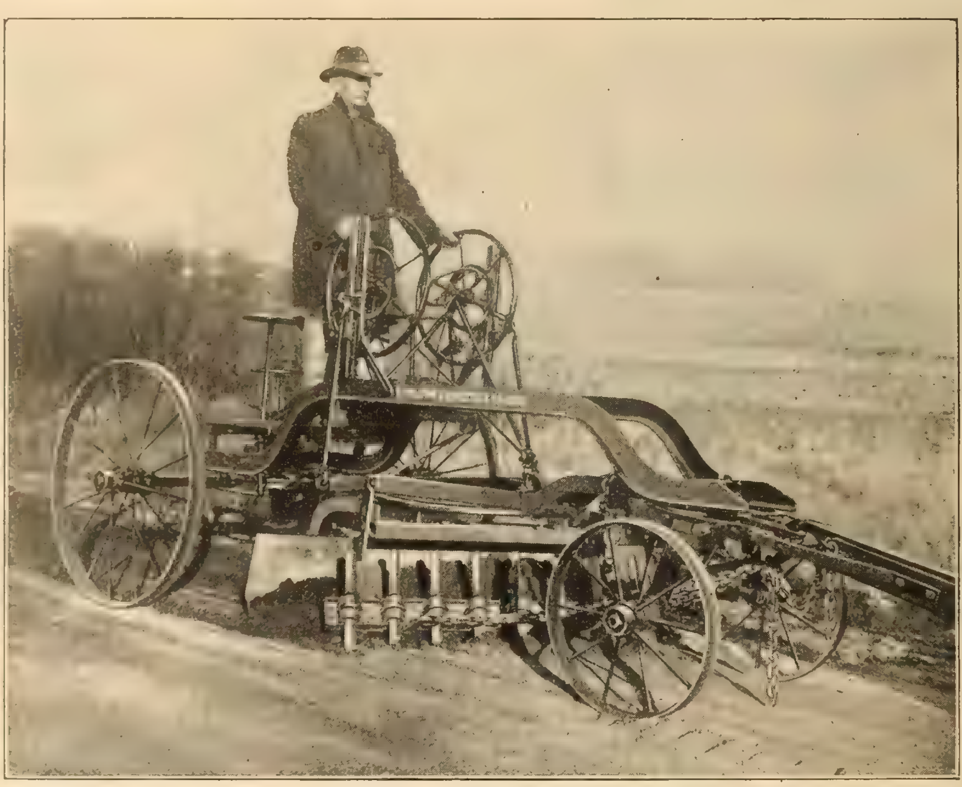
Burch Stone Spreader with wings

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

MUSSENS M LIMITED

Practical Road Maintenance Under Motor Traffic



Little Western Road Maintainer

Gravel Road Maintenance under motor traffic calls for a special tool to handle the situation.

We offer the Little Western Road Maintainer as an economical and practical solution of the new problems involved. It is a standard Little Western Road Machine, already favorably known in Canada, fitted with a scarifier attachment. The scarifier, carried in front of the blade, digs into the hard surface of the road to a depth of an inch or two and loosens up enough material for the filling of holes and small ruts by the blade.

The scarifier has great flexibilty of adjustment, it moves with the blade, and can be regulated easily to a fraction of an inch. It can be made to ride clear of the ground when not needed for scarifying purposes.

We unreservedly recommend this new machine to our Canadian friends, as a practical and economical solution of the vexatious problem of road maintenance under motor traffic.

Our new illustrated catalogue, C-54, gives full details and specifications, and will be sent without charge on request.

Western

Back of this name are nearly 50 years of successful service.

MUSSENS LIMITED

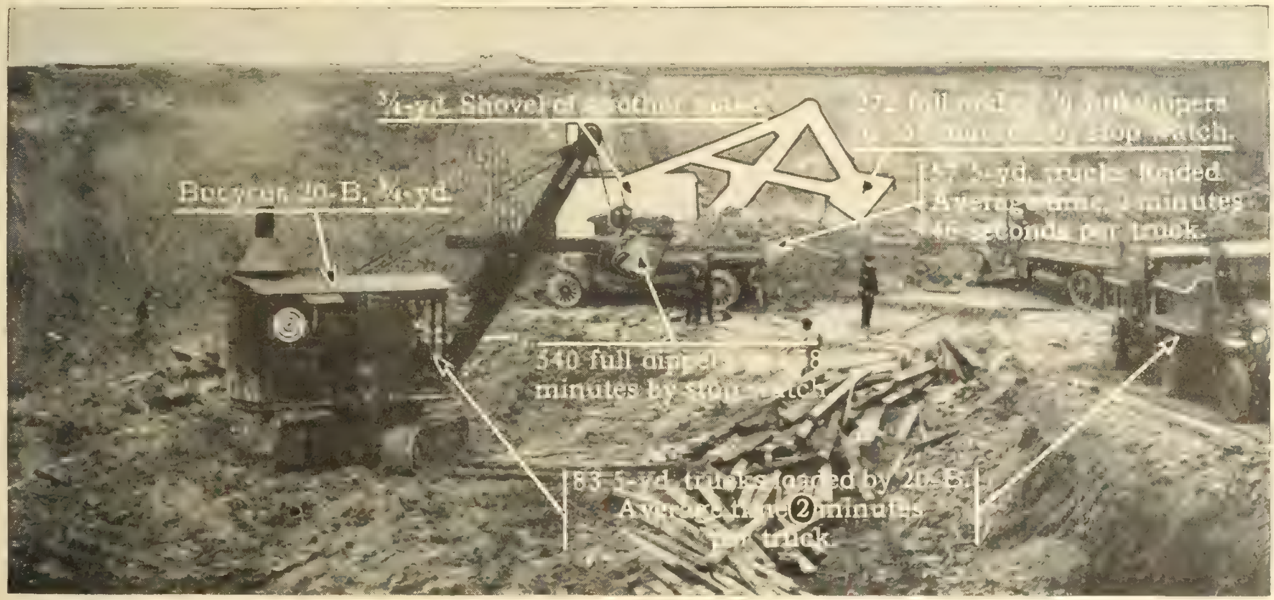
Montreal Toronto Winnipeg Vancouver

MUSSENS M LIMITED

It Was an Average BASEMENT JOB—

and they were short of trucks — for long periods the shovels sat pretty, popping off into the air, waiting — when trucks showed up the shovels gave them all they had, to keep things moving. There were two of them, a Bucyrus 20-B and another make of the same size; the conditions were identical, operators expert, material packed sand—

Here Is What Happened—


¾-yd. Shovel of another make
[illegible] full and [illegible] full dippers in [illegible] minutes by stop watch.
Bucyrus 20-B, ¾-yd.
[illegible] 5-yd. trucks loaded. Average time, [illegible] minutes 46 seconds per truck.
540 full dippers in [illegible]8 minutes by stop watch.
83 5-yd. trucks loaded by 20-B. Average time ② minutes per truck.

On hundreds of jobs like this contractors are looking for the shovel that can outdig the other shovel — THE SHOVEL WITH SPEED — they've got just that in the 20-B.

HERE ARE FIVE REASONS WHY:

1. OUTSIDE DIPPER STICKS AND BOX-GIRDER TYPE BOOM — Boom lighter — easier to swing — better balance. A distinctive Bucyrus feature.
2. TWO-PART HOIST — The dipper overhauls and hoists faster. Another Bucyrus feature.
3. EASIER TO OPERATE — An improved 3-lever control — a comfortable seat for the operator — same lever for throttle and ram — load may be lowered with release throttle without foot brake.
4. SCALE CHAMBER BOILER — Means less foaming — easier steaming — less water troubles. A patented Bucyrus feature.
5. SIMPLER, STRONGER CATERPILLARS — Only two tumblers and two rollers — less parts than any other built, easier to keep up — lubricated only where lubrication is desirable — bearing and rollers all high out of mud and water.

THE TRUCKS MOVE FASTER UNDER A 20-B

BUCYRUS Small Revolving Shovels are built in the following sizes:
20-B — ¾-yard. 30-B — 1, 1⅓-yard.
50-B — 1¼ to 2-yard.
Also as Draglines, Clamshell Excavators, Cranes, Etc.

Send for Bulletin **C-D** and state which size you are interested in.

BUCYRUS

Established in 1880
A Special Plant Devoted Exclusively to Small Revolving Shovels
Railroad Type and Revolving Shovels of all sizes, Dragline Excavators, Trench Excavators, Dipper, Hydraulic and Placer Dredges, Spreader Plows, Wrecking Cranes, Etc.

513

Mussens Limited, Montreal, Que.—Toronto, Ont.
Dominion Equipment & Supply Co.
Winnipeg, Manitoba

MUSSENS LIMITED

AN AUTO-CRANE ON YOUR JOB IS A HANDY PIECE OF EQUIPMENT

For Clam Shell or as an ordinary derrick, for excavating, loading or unloading cars of material

BYERS CRANES

Half-Circle or Full Revolve on Car Wheels, Road Wheels or Caterpillar Traction

Steam, Gas or Electric Power

½yd-¾yd-1yd

Send for particulars

We have a Complete Line of Road and Excavating Machinery
SMITH MIXERS - MARSH HOISTS - INSLEY CHUTING
Barber-Greene Bucket Loaders and Portable Belt Conveyors

MUSSENS LIMITED
Montreal Toronto Winnipeg Vancouver

MUSSENS LIMITED

"It has proven to be the best Machine that I have had on my work"

vard Revolving Sh

It has proven itself to be the best mach on my work and will handle a greater yarday let me call your attention to the fact that machine loaded seven 7 yard trucks in 14 r continued throughout the day at this ra keep the trucks to the shovel although one machine The haul was of co necessitated some idleness on the pa belief this shovel could have loade that day had it had the trucks to lo

Que. — Toro

MUSSENS LIMITED

Western Dump Cars in Road Work

Heavy Road Grading in Minnesota

Western That's Why

The heavy cuts and fills necessary in modern road construction justify the use of small Western Dump Cars where the haul is too long to be made economically with dump wagons.

The size of dump car depends on local conditions —never more than 4 to 5 yd. capacity. The make should be Western every time, for the simple reason that Western Dump Cars permit greater production with less cost of maintenance than other dump cars. They will OUTWORK and OUTLAST any other dump cars on the market.

Our experienced road engineers will be glad to analyze your road contract and advise entirely without obligation on your part.

Send for our new catalogue of Contractors Equipment, J No 37

MUSSENS LIMITED
Montreal Toronto Winnipeg Vancouver

Mussens Limited have recently signed a contract for three pages in color in every issue of this paper for a year.

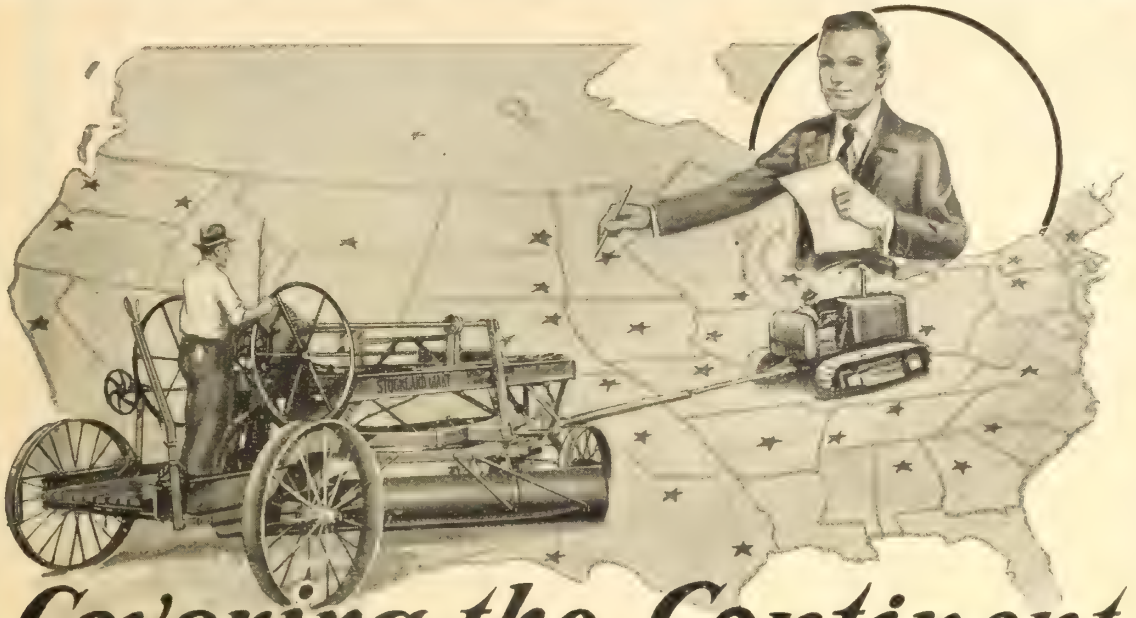
That, perhaps, more eloquently than any testimonial they could write, expresses their opinion of the value of advertising in Canada's leading publication in the construction and engineering fields.

If Mussens were a young firm or a new advertiser this decision of theirs might not have so much significance.

The fact is, however, that for **20 years** an advertisement for this firm has been appearing in every issue of "Contract Record", and this increase of 300 per cent in the volume of their advertising in this one paper has been made after the most exacting test of the value of the publication.

Experience has evidently taught them that the buyers of heavy equipment in Canada read and are influenced by the advertisements which appear in "Contract Record".

Contract Record
and Engineering Review



Covering the Continent with Stockland Service

There's a Stockland "Service Station" within 12 hours of your road job.

51 successful and responsible concerns cover the continent with Stockland Service—each has a Stockland-trained man and each maintains a full factory-type repair department.

Yet, in the face of old machines being a year older and in face of a greatly increased number of new Stocklands in service—this year the repair cost ***per grader*** on all Stockland machines (already the lowest of any grader) was ***cut exactly in half.***

This means that Stockland owners ***saved*** the amount of this decrease in repair costs—they also avoided the greater cost of the inconvenience and delay of ***needing*** repairs.

Send for Stockland 1923 literature—know why Stocklands make "better roads—cheaper."

AVOID AN UPKEEP COST NOT COMMONLY CONSIDERED.

When your grader needs repairs the largest cost is in the inconvenience and delay caused.

Stockland Quicklift Graders are ***built at the factory***—there's no re-building needed on the job.

Every part is designed for its special work and made of material best fitted to do that work

You pay slightly more when buying a Stockland—but you save it all ***and more*** by the end of the first year's service.

Stockland literature will give you the details of this more satisfactory method of construction; also the Stockland over-strength frame, Built-in Steering Device, Cutting Blade, Curved Moldboard, and the Stockland Quicklift

These are practical money-and time-saving features that appeal to long headed and far-sighted contractors and highway officials. It will pay ***you*** to know about them.

Stockland

STOCKLAND ROAD MACHINERY CO.
MAKING BETTER ROADS CHEAPER

ROAD MACHINERY CO ~ MINNEAPOLIS

2701 34th AVE. SOUTH

Canadian Representatives:

Richardson Road Machinery
Saskatoon, Sask.

Francis Hankin & Co., Limited
598-604 Union Ave., Montreal, Que.

MUELLER Lead Flange Goose Necks and Curb Cocks

These two *MUELLER* items (A 500 and A 584) are standard in lead flange connections for service work, and embody the well known *MUELLER* standard of quality, which invariably insures dependable service at minimum upkeep.

MUELLER Lead Flanging Machine

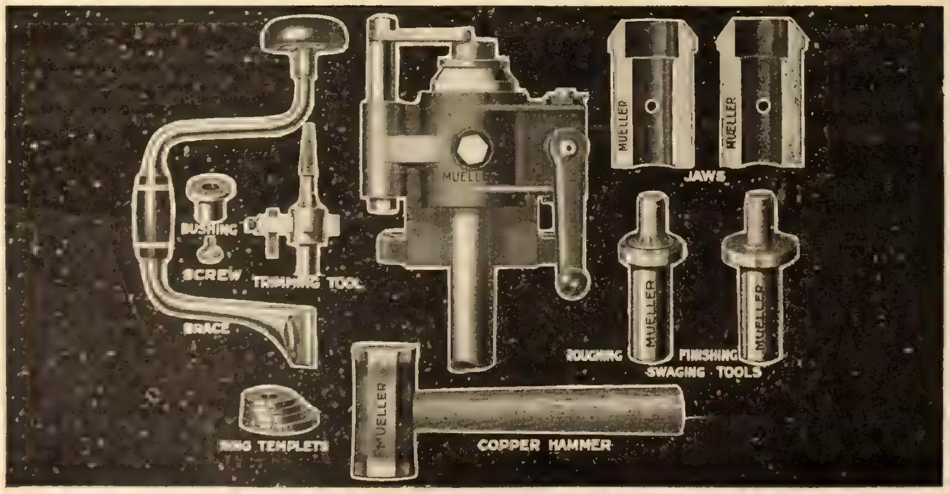
This hand-operated, direct drive *MUELLER* Machine (A 277) is so perfect in mechanical detail that with it anyone can make lead flange connections easily, quickly, and economically—either at the bench or the machine can be attached to a board for portable work—and can be used in either a vertical or horizontal position. Write for description and prices.

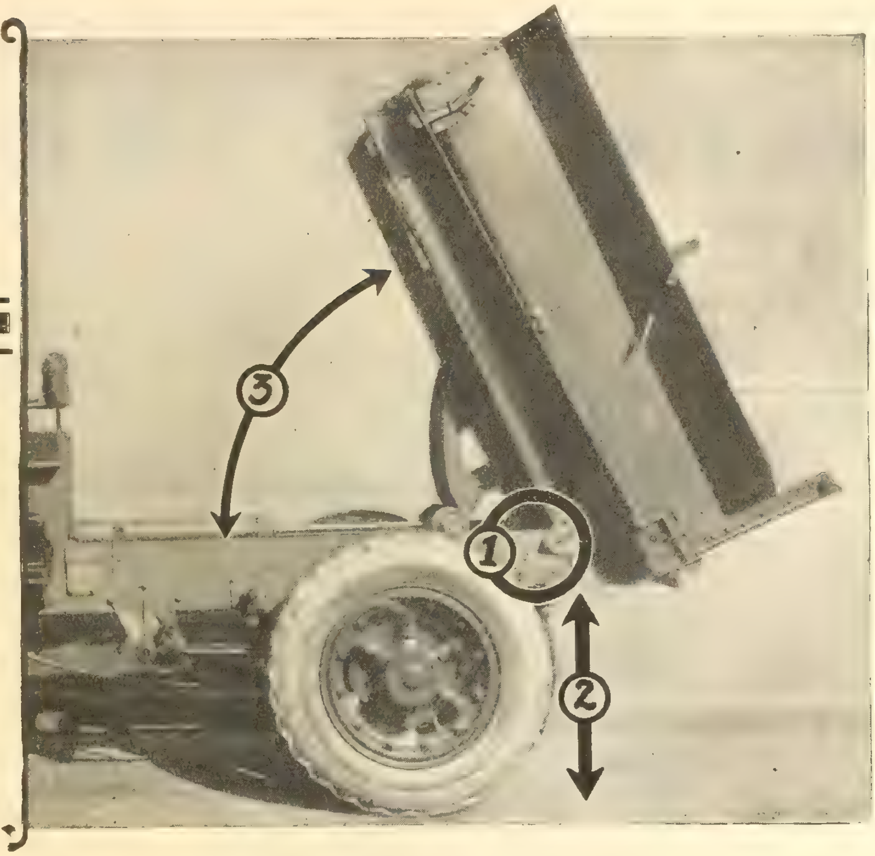
H. MUELLER MFG. CO., LIMITED, SARNIA, ONT.

Water, Plumbing and Gas Brass Goods and Tools.

American Factory at Decatur, Ill., U. S. A. Branches, New York and San Francisco

Mueller Metals Co., Pt. Huron, Mich., Makers of "Red Tip" Brass Rod: Brass and Copper Tubing: Forgings and Castings in Brass, Bronze and Aluminum: Die Castings in White Metal and Aluminum: also Screw Machined Products.





Wood-Canada STEEL BODIES are Lighter and Stronger!

The arguments in favor of the all-steel body over wooden bodies reinforced with steel are overwhelming—and there is very little difference in the price.

Let us tell you why more than 90% of the truck manufacturers of the world use "Wood Hoist & Bodies."

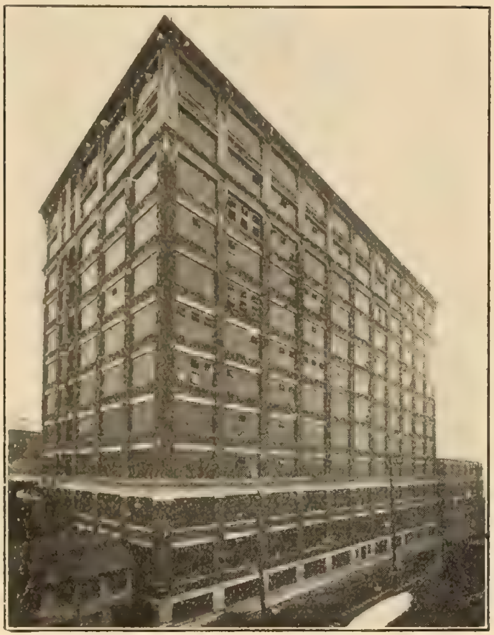
Wood Hydraulic Hoist & Body Company Ltd.
1025 TECUMSEH ROAD WINDSOR, ONTARIO

WOOD
CANADA

Quality ***Service***

Ormsby Products

- Ormsby Lupton Steel Sash.
- Ormsby Hollow Metal Sash.
- Ormsby Rolling Steel Doors.
- Ormsby Kalemein Doors.
- Ormsby Kalemein Bronze Doors.
- Ormsby Kalemein Copper Doors.
- Ormsby Tin Clad Doors.
- Ormsby Revolving Doors.
- Ormsby Counterbalanced Doors.
- Anything in sheet metal up to 10 gauge.


ORMSBY-LUPTON STEEL SASH

- Ormsby Skylights.
- Ormsby Swartwout Ventilators.
- Ormsby Tanks Welded.
- Ormsby Tanks Riveted.
- Ormsby Transformer Tanks.
- Ormsby Garages Metal Clad.
- Ormsby Special Buildings.
- Ormsby Corner Bead.
- Herringbone Metal Lath.
- Expanded Metal Lath.
- Roofing of all kinds.
- Jobbing Contractors.

Service ***Quality***

ORMSBY products are produced by experts in each department and are so constructed as to meet the approval of the most exacting. If building insist on ORMSBY products. Learn to know the real meaning of the word SATISFACTION.

Representatives located in all parts of the Dominion

The A. B. Ormsby Company Limited

48 Abell St., TORONTO, ONTARIO

Associated with

The Metal Shingle & Siding Co., Limited

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Some Plain Speaking is Needed

Is the Sanitary District of Chicago diverting from eight thousand to ten thousand cubic feet per second from the Great Lakes? This is the charge recently made by Sir Adam Beck. He states that the Sanitary District has the sanction of the United States Government to divert 4167 c. f. s. but that Canadian consent was never given, even for this amount.

What is the difference between taking water from an international source for domestic use and taking it, for example, for hydro-electric purposes? Yet the United States has always respected her agreement with Canada regarding the use of Niagara River for power development. Any other policy would, of course, be merely common theft. In what way does the water diversion at Chicago differ? Putting the most favorable interpretation on it the use of this water without Canada's consent is an over-aggresive policy and what, in private life, would be termed "cheeky." To take more even than that allowed by the home government differs only in degree, and is merely a more flagrant violation of the law of decency. That Canada has borne this almost-insult in the past is no doubt due to her desire to live at peace with her neighbor, with which is coupled that hereditary element of sportsmanship that leaves it to the umpire to say when the opponent is playing a dirty game. In the absence of the umpire, however, it is doubtful if any moral code requires that we should sit by and watch our neighbors coolly appropriate to their own use a natural resource that belongs to us quite as much as to them. It seems to be about due for our government to stop taking things for granted and do a little plain speaking.

The Canadian National Exhibition

Year by year in the forty-four years of its existence the Canadian National Exhibition has grown with consistent regularity until it has attained the distinction of being the greatest annual fair in the world. In point of attendance alone, Toronto's great exhibition leaves all others far behind. Last year, for example, 1,372,500 people passed through the gates—visitors from all parts of the continent and from overseas. The daily average attendance of 106,000 was double that of any of the state fairs of the United States and a record unsurpassed by any world's fair of the past in the same number of consecutive days.

In the character of the displays, however, the Canadian National Exhibition shows an even greater measure of superiority. The resources of Canada, natural and manufactured—indeed, the resources of many other countries—are gathered together and housed in over four score permanent buildings, representing an investment of $11,000,000. Spacious grounds, majestic structures and striking backgrounds make a wonderful show case for the display of a nation's products garnered from factory and farm, mine and forest, lake and ocean, studio and office. While education is the motive constantly in view, the recreational possibilities are not overlooked, and so it is that the visitor has a wide choice at his command from thrillers to grand opera.

This year the Exhibition takes on a new and broader aspect. With exhibits from several foreign countries endorsed by their respective governments, it becomes virtually a world's fair. Plans which are under consideration at the moment anticipate the development of this idea, so that ultimately the Canadian National Exhibition may become truly a permanent annual world's fair.

For the engineer or the contractor the C.N.E. is a veritable storehouse of knowledge and information. Almost in no other way is it possible to see within small compass so great an array of engineering and construction materials and equipment. These are presented in a manner that will attract the attention of those interested in them and will give an idea of their value and serviceability that cannot be obtained by viewing them in shop or office. Canada's National

No. 95

Canada's Engineers—J. M. Wardle

The recent opening of the Banff-Windermere motor road through the heart of the Rocky Mountains offers an opportune occasion for presenting the biography of the engineer through whose efforts this road was largely possible. He is Mr. J. M. Wardle, chief engineer of the Canadian National Parks Branch, Ottawa. It was fifteen years ago that Mr. Wardle began to acquire his engineering experience. Commencing as draughtsman with the Canadian Northern Pacific Railway in British Columbia he held positions on location, surveys and construction work until he became assistant division engineer. His chief work during these years—1908 to 1912—was on the location and construction of the main transcontinental line through the lower Fraser River canyon, a work which involved exceptionally heavy grading and rock cuts. At the same time he was taking his civil engineering course in Queen's University and in 1912 he graduated with honors, obtaining the degree of Bachelor of Science. He then became municipal and assistant town engineer of Chilliwack, B.C., his work in this connection comprising land surveys, highway location, drainage schemes, waterworks surveys and street paving.

In 1913 Mr. Wardell entered the service of the Dominion government first as highway engineer on the staff of the Canadian National Parks Branch, Department of the Interior. In this capacity he undertook location and construction work in connection with main highways in all the national parks. Five years later, in 1918, he was appointed superintendent of the Banff National Park with headquarters at Banff, Alta. This park has an area of 2,751 square miles, contains several towns and is the most highly developed of the national parks.. Mr. Wardle's duties as superintendent embraced direct administration of the park, enforcement of park regulations, fire and game protection, maintenance of roads and bridges, maintenance and construction of water and sewer systems, the operation and supervision of large government establishments in the park, the operation of the government telephone system and the handling of a large amount of revenue.

In the fall of 1920 Mr. Wardle became chief engineer of the Canadian National Park Branch. In this position the work under his jurisdiction has been most diversified and covers all lines of survey and construction work, including all classes of municipal work, highway work, building construction, etc. During the past two years he has undertaken and completed the construction of the Banff-Windermere highway through the Rocky Mountains—a magnificent motor road 53 miles long, of which 43 miles were built to standard width in nine months of actual grading operations.

Mr. J. M. Wardle

Exhibition—the Annual World's Fair—will be well worth the visit of engineers and contractors if for no other purpose than seeing the commodities and equipment that interest them in their every-day work. But for those who go with the proper perspective, the Fair will cater to much more than their personal interests—it will offer a true and complete impression of Canada, her resources, her capabilities and her people.

An Anniversary Catalog

The Industrial Works of Bay City, Michigan, is now issuing a Golden Anniversary Catalog, commemorating 50 years of service to industry and containing complete illustrations, engineering data and performance records of its products, which consist of rail, traction and crawling tractor locomotive cranes, wrecking cranes, wharf, barge and gantry cranes, transfer and pillar cranes, railroad pile drivers, combination crane-pile drives, portable rail saws, transfer tables, steam pile hammers and buckets.

The foreword and history of cranes outlined in this catalog not only points out the fact that "Industrial" products are 50 years old in experience, but goes back into the times of the pyramids—5,000 years ago—illustrating and describing the different methods of hoisting, transferring and material handling up to more modern times. Following are illustrations and a full description of a trip through the Industrial Works plant.

The balance of the book is divided into sections. Section One illustrates and describes rail, traction and crawling tractor cranes from 5- to 60-tons capacities for operation by steam, gasoline or electricity; and barge, wharf and gantry cranes. Eleven different types within these capacities are explained with full engineering and operating data. In Section Two is found full information regarding "Industrial" clamshell buckets, grapples, magnets, generators, draglines, dipper arms, scale proof boilers, oil burners, lighting equipment and special booms.

The third section explains and represents the entire line of "Industrial" steam and electrically operated wreckers from 75- to 200-tons capacities for railroad operation and heavy construction work. Section four covers special railroad equipment, such as electric and hand operated piller and transfer cranes, portable rail saws for railroad maintenance, and transfer tables. Section five illustrates and describes "Industrial" pile drivers, combination pile drivers and locomotive cranes, steam pile hammers and pile driving leads. The last section gives special foreign features and equipment made for export railroad and commercial trade.

Political Juggling of Municipal Tenders

Is Thorold Town Council Guilty of Dishonesty or Just Acting in Ignorance?—Nine Contractors Put to Heavy Expense and Not Given a Show

The following letter from a contractor reader again raises a point we have discussed on various occasions in these columns. The logic of his argument is clear—the solution of the problem not so clear. He writes as follows:

> Editor, Contract Record:
>
> I desire to direct your attention to an incident in connection with the town of Thorold, Ont., believing wide publicity as a caution to others is best through your medium in any way you see fit.
>
> In your Contract Record of two recent issues, tenders were invited for 45,000 sq. ft. of sidewalk. Tenders were opened at the Council Board on Aug. 6th, there being 10 competitive bids by representative contractors. The writer was present. Three tenders were close. The prices ranged over the whole from $10,800 to $14,000, of which the highest was by a local firm of contractors.
>
> The Board deferred decision, calling for a recommendation of their engineer, which was to be considered at a subsequent meeting on the 10th. The town engineer, Mr. R. N. Rutherford, was present at the subsequent meeting and recommended the lowest tender, a representative firm, there being two other firms with but a few dollars' difference. In the face of their engineer's recommendation and pleading, the council awarded the job to the highest tenderers, the local contractor.
>
> While the writer's firm tendered on this work we were not the lowest tenderers. The point we desire to make is:—There were 10 firms who went to Thorold at considerable time and expense, reviewed the plans and covered the site, believing in the good faith of the parties calling for tenders; whereas the entire thing would appear but a subterfuge or camouflage for a piece of local political knavery.
>
> Yours very truly,

. . . .

The point that at once appeals to one who studies the situation is the tremendous cost of carrying on the building and construction industry on such a plan. Perhaps the Thorold council imagined that all these other nine contractors were submitting tenders at their own expense. Nothing could be farther from the fact, however. Contractors have no other source of revenue than those who employ them to build—it may be individuals, firms or municipal bodies. It follows that a certain percentage of the cost of every job includes something for tendering. If every contractor got every job he tendered on this load would be evenly distributed and comparatively easy to bear. Where he gets only one job in ten, the cost of tendering on the ten must be borne by that one job. It may sound theoretical but it's real hard fact from which there is no escape. Whatever the cost was in this particular case the town of Thorold will find, if it looks carefully enough, that this is included in the successful tenderer's figure.

In actual dollars and cents it is difficult to say what the cost of estimating is. It varies tremendously with the work, the firm, and the times. A fair average is probably not less than one per cent. On that basis the Thorold job cost each firm, say, one hundred dollars; total cost to the ten firms, one thousand dollars, which, if this average holds, the town of Thorold pays.

This phase of the problem will only be satisfactorily solved when the submission of a tender is recognized as a service rendered, to be paid for as we pay for any other service. And in addition to service rendered there is an obligation assumed, to fulfil a contract. The acceptance of any tender might, therefore, well represent the acknowledgement of the obligation to pay for it.

The other point that strikes one is the unreasonableness of the award to a local firm and at a much higher price, after calling tenders. What was in the mind of the town council? Apparently they were finally influenced by local considerations. Perhaps they didn't know until the last minute that they were going to be so influenced. If they called tenders knowing beforehand that a local firm would be chosen in any case, were they not dishonest? If they were influenced at the last minute were they not both weak and dishonest, for they were spending the electors' money without getting value?

Aside from these two aspects of a general problem there is the important question of the wisdom of restricting competition by excluding outside bidding—for the town of Thorold could scarcely expect competition from the same firms if it called tenders on another piece of work. There may be ample justification for a Made-in-Canada policy but surely not for a Made-in-Thorold one. That is provincialism in its most extreme form. However, granted that this is the avowed policy of any local body there is no excuse whatever for not placing the facts squarely before the contractors so that they will not be spending their money for nothing. If outside competition is not wanted let the fact be stated plainly.

Unfortunately the town of Thorold is not an isolated case. Possibly the matter has never presented itself to them in its proper light. It may be, if the "ethics" of the thing has been brought to their attention, that they have remarked on the absence of ethics among the contractors themselves. The fact we must face however, is that what happened in Thorold is happening every day in the contracting industry and the question we must answer first is "are the contractors themselves doing everything in their power to remedy the evil?" When the building and construction industry can present a united front they can wield a tremendous influence in regulating the conduct of their employers.

500,000 H. P. Stolen From Canada Annually

Arbitrary and Unauthorized Diversion of 10,000 c.f.s. from International Waters by Chicago Sanitary District Robs Canada of the Equivalent of Thirty-five Million Dollars per Annum

By SIR ADAM BECK,
Chairman, Hydro-electric Power Commission of Ontario

In a press despatch from Chicago, under date of the 19th of July, 1923, President William J. Healy of the Sanitary District of Chicago is credited with stating that "there is not now any dispute between the Canadian authorities and the Sanitary District of Chicago," adding that "it was to eliminate the possibility of one that we took this trip."

The Sanitary District of Chicago is the territory, including the city of Chicago and its outlying areas, over which a specially appointed board exercises jurisdiction in respect of matters of sanitation.

President William J. Healy, accompanied by a number of officials of the Sanitary District of Chicago, recently made a tour through Eastern Canada, visiting Toronto, Ottawa and other places.

The object of this visit was to facilitate negotiations looking toward an adjustment of the difficulties in which the Sanitary District of Chicago finds itself by reason of its illegal diversion of water from the Great Lakes system to the Mississippi River. The water is diverted for the purpose of diluting the sewage effluent with sufficient water to render it inoffensive. The Sanitary District has at times been diverting an amount of water which is about equal to the amount which passes over the American Falls at Niagara.

The visiting committee announced that they are seeking authority from the United States Congress for the use of the water now being diverted from the Great Lakes system, and in this connection they evidently desired, if possible, to allay any opposition from Canadian interests on account of the great loss which Canadian interests have sustained by reason of this diversion.

As a remedial measure, the Sanitary District, according to its own statement, proposes to construct regulating works, one in the Niagara River below Buffalo, and another in the St. Lawrence River at Galops Rapids, at an estimated cost of $2,500,000, to be borne by the Sanitary District.

It is contended by the Sanitary District officials that these remedial works will restore the lake levels which have been disadvantageously affected by the diversion at Chicago.

Now, the whole subject to which these facts relate is one which has not been properly presented to the Canadian public by the visiting committee, and, moreover, such statements as have been made really tend to confuse the issue. The object which the Sanitary District of Chicago seek to attain is one of such vital importance to Canada as a whole, and to the water-power situation of the Province of Ontario in particular, that statements such as have been published in the press as a result of the visit of the Sanitary District officials cannot go unchallenged.

Navigation Interference

It is, of course, an obvious fact that the abstraction from the watershed of the Great Lakes of any large quantity of water such as the Chicago Sanitary District is diverting must materially affect the levels of the Great Lakes, producing, in consequence, a serious effect upon navigation. This aspect of the diversion is not denied, but is acknowledged by all the authorities that have dealt with the effect of Chicago's diversion. The United States Secretary of War, in an official decision refusing a former request from the Sanitary District of Chicago for 10,000 cubic feet of water per second from Lake Michigan, stated that such diversion would substantially interfere with the navigable capacity of the navigable waters in the Great Lakes and their connecting rivers. And he emphasized that the provisions of the Canadian treaty for a settlement by joint commission of "questions or matters of difference" between the United States and Canada offer a further reason why no administrative officer should authorize a further diversion of water, manifestly so injurious to Canada, against Canadian protest.

Every important navigation interest, from the head of the Great Lakes to the sea, has presented itself at the bars of various tribunals petitioning for remedy against loss to its navigation interests. The proposal of the Sanitary District is to install the regulating works just referred to so that they may be operated in a manner, so far as possible, to restore the levels for navigation. No matter what may be the means adopted for regulating the levels of the Great Lakes, their connecting waterways and the St. Lawrence River, it is clear that, with 10,000 additional second feet, the regulation could be made just that much better. In other words, it is impossible, by artificial means, to compensate the international waters for the thousands of cubic feet of water which are being continuously diverted from them by the Sanitary District. It is not my purpose to enter into any discussion of the navigation aspects of the situation. Navigation is an interest under the jurisdiction of Federal authorities, and it is assumed that the Federal authorities of Canada will spare no effort to fully safeguard Canada's interests in this respect.

The Court in the United States has declared against the large diversion being made by the Sanitary District of Chicago, but the Sanitary District has simply ignored such authoritative order against its diversion.

Canada's Power Resources Sacrificed

It is my desire rather to refer to the tremendous loss which the whole Dominion sustains by the illegal diversion at Chicago by reason of losing the hydro-electrical energy which might be developed from the large quantity of water which Chicago is diverting.

Chicago has a right, so far as independent sanction by the United States is concerned, to divert 4,167 cubic feet of water per second. This right, however, so far as I am aware, Canada has never conceded nor recognized.

The Sanitary District has not respected even the limitations of this 4,167 cubic feet, but has been diverting in excess of 8,000 cubic feet per second, and, it has been rumored, has, at times, been diverting some 10,000 cubic feet, or possibly more, of water per second. This water, as just stated, is used for diluting the sewage of the city of Chicago and of other places of the Sanitary District, and is also employed for the development of hydro-electrical energy for the supply of light and power to places in the Sanitary District.

The development of hydro-electrical energy is an important factor in the operation of the Sanitary District. Even this phase of the Sanitary District's work, however, is conducted at the expense of other portions of the country, both in this Dominion and in the neighboring Republic. The power developed from the diverted water utilizes only a relatively small head on the water-course through which the diluted sewage passes to the Mississippi River, whereas this same water would develop many times the power in flowing to the sea via the Niagara and St. Lawrence Rivers. If 10,000 cubic feet of water per second were diverted by Chicago and were returned to its natural channel, then it would develop at the falls and rapids in the Niagara and St. Lawrence Rivers, approximately 500,000 horsepower, of which over 300,000 horsepower would belong to Canada—it will be recalled that a portion of the St. Lawrence River lies wholly in Canadian territory. Upon a conservative basis 500,000 horsepower may be considered the equivalent of 5,000,000 tons of coal per annum, and, at a recent price of soft coal, the equivalent of about thirty-five million dollars per year.

Compensation

Obviously, the proposal to make an investment in some permanent works of only $2,500,000, as is proposed by the Sanitary District, could not be taken into serious consideration as a means of compensating for an annual loss of upward of $35,000,000.

Now, the feature which cannot be too strongly emphasized is that it is impossible for the Chicago Sanitary District or any other agency to do anything by means of the regulation of levels of the Great Lakes to compensate the Dominion of Canada for its loss in the international waters which Chicago is diverting. No matter what is done in the way of compensating for levels, after the compensation is accomplished, 10,000 cubic feet of water diverted from the Great Lakes could not be restored to the Great Lakes and rivers and contribute, as an addition, all the benefits derivable from such quantity of water.

It is illegal without proper sanction to divert international waters from their natural course. These waters are the joint property of both countries. Every foot of water, therefore, which Chicago takes out of the Great Lakes is a direct loss to the Dominion of Canada, and is a loss, also, to the State of New York and to every State that might benefit from the United States' share of the diverted waters if allowed to course via their natural channel to the Atlantic.

There is another feature which should be appreciated, and that is that, even if remedial works are put in for the restoring of desired levels for navigation, the maintenance of such levels will doubtless require the holding back of water for storage purposes in order to maintain the levels, which water will be withheld at the expense of the flow which otherwise would be available for power.

The State of Michigan itself, the State of Wisconsin, the State of New York, the Provinces of Ontario and Quebec, and the Federal Governments both of the Dominion of Canada and the United States, have all registered strong protest against illegal diversion of the waters of the Great Lakes as is being done by the Sanitary District of Chicago.

Where Will Outrage Stop?

These various protests have, in effect, been ignored. The Sanitary District has continued to divert water greatly in excess of the 4,167 feet per second for which it has the sanction of its own Government, but, as stated, not the sanction of the Government of Canada. It cannot too clearly be understood that the Sanitary District is not seeking permission to divert water in excess of the 4,167 feet per second, because the Sanitary District actually is diverting water in excess of this licensed quantity, even up to some 8,000 or 10,000 feet per second, without securing permission from the proper authorities.

The Sanitary District, when designing its canals, evidently contemplates the course which it has pursued. The Chief of Engineers of the United States War Department, in a memorandum to the Secretary of War, stated that the canal works are now found to be large enough for a total diversion of 14,000 sec. feet; and, in fact, the late Chief Engineer of the Sanitary District himself stated that it was his hope and intention to excavate a channel with a capacity of 16,667 cubic feet per second.

The Sanitary District has been pursuing its own course, and what it seeks today is Governmental sanction for that which it has been doing and is still doing, illegally.

Lost Power a Great Loss

President Healy does not refer to some of the prominent features which must necessarily govern in any consideration involving Canada's interests as affected by the illegal diversion at Chicago. For example, even granting, for purposes of discussion, that the $2,500,000 would provide such compensatory works as the Sanitary District officials propose, such works would never compensate Canada for an annual loss of nearly ten times such a sum; that is to say, for the loss of a revenue equivalent to what would be produced from an investment of about $400,000,000.

When the time comes that a satisfactory recognition of Canada's rights may be secured, Canadian interests will not be sacrificed. Meantime it is desirable that the citizens of the Province of Ontario should know that there is nothing in the suggestions made by the officials of the Sanitary District who recently made the tour through Canada which are other than detrimental to the great water-power resources of this Dominion and of the Province of Ontario, and it is with this object that I have felt led to make a public statement respecting the true significance of the proposals which have so plausibly been presented.

Three hundred and fifty municipalities in the Province of Ontario, comprising practically all the cities, towns and villages in the more settled portions of the Province, and including the cities of Toronto, Hamilton, London, Ottawa, Brantford and Windsor, have invested in their municipally owned hydro-electrical undertaking $250,000,000, and in the future this amount will annually be increased by millions of dollars.

The Province of Ontario owns the surplus waters flowing in boundary waters, including the St. Lawrence River, and the municipalities of Ontario do not propose that their large investments in their municipal hydro-electrical undertaking shall remain under the serious handicap consequent upon the Sanitary District of Chicago diverting such a substantial portion of the flow of the Niagara and St. Lawrence Rivers. By virtue of the fact that the Province of Ontario owns the surplus waters in international waterways bounding the Province, the diversion at Chicago occasions a loss which, especially from the water-power standpoint, falls directly upon the citizens of the Province of Ontario.

An Act Without Parallel

The action of the Sanitary District of Chicago in illegally diverting from the Great Lakes system the enormous quantity of water which is being turned into the Mississippi River is an act without parallel on the American continent. The citizens of Canada, and especially the citizens of Ontario, are concerned to know how much longer the United States authorities will permit the officials of the Sanitary District of Chicago to continue its diversion in defiance of every interest excepting the interests of the Sanitary District itself.

It is important for the citizens of this country fully to understand the significance of what is being attempted by the recent visit of the missionaries of the Sanitary District. Certainly, the citizens of Ontario are not misled by such inadequate and superficial propositions as have recently been presented by the officials of the Sanitary District of Chicago.

Grade Separation in Kitchener, Ont.

The city of Kitchener, Ont., has engaged the firm of James Proctor & Redfern, Limited, consulting engineers, Toronto, Ont., to report on the grade separation of the Grand Trunk tracks. The work contemplated consists of the separation of seven grades, entailing subways or overhead bridges. The work has been roughly estimated at $1,000,000.

A report from Bracebridge, Ont.; states that a new breakwater is being constructed below the falls, Tom Bruce having the contract.

The Week's Developments in a Nutshell

Almost every day there is some new evidence of the inestimable importance to Canada of her North Country. A retail salesman who is in the midst of a trip over the gold and silver mining districts writes this week—"In every case, everyone is busy and most optimistic and all are looking forward to a good fall and winter trade. As proof of this they are increasing their orders." He goes on to speak of the "splendid spirit of the North." He says "merchants are improving their stores inside and out. Haileybury is building up rapidly, both residences and stores, and you will see up-to-date store fronts the same as on Yonge Street, Toronto. New Liskeard and North Temiskaming are busy transporting supplies for the new Quinze power dam and plant which is to supply power to Porcupine and other mining centres. There is a rush on at Elk Lake at present where more than a thousand prospectors have already gone in via the Montreal River and the Matachewan. Whole townships are already staked out and prominent engineers both from the United States and England are on the ground superintending an extensive campaign of diamond drilling." He writes further of T. &. N. O. extensions and the boom in Dane Station, Swastika, Larder Lake, etc.

Kirkland Lake, he calls the "hub of the district" and says that "buildings are going up and merchants opening new stores every day." Of Timmins he writes: "Timmins is the wonder city of the North and it is predicted will have a population of 50,000 people within the next ten years."

From another correspondent comes the news of activity at Kapuskasing. The Spruce Falls Company are building more than fifty houses and giving evidence of big future activities. He says the experimental farm there is one of the finest in the province with up-to-date buildings, good stock and growing a wide variety of farm products; and yet, as the crow flies, this point is a comparatively short distance from James Bay. Construction on the Hollinger power developments is being rushed. Work is well advanced at the power plant and parties are out locating the power line. Common labor is said to be difficult to get.

Another evidence of our northland resources is given in a recent government report on the pulp industry. At the present time there are one hundred and four pulp and paper companies operating in Canada. The United States having devastated their own pulp areas are now clamoring for ours. On no account should we relinquish in the slightest degree our commanding control of the pulp situation on this continent.

There is an apparent tendency during the week for building material prices to stiffen. This is most noticeable in steel and iron lines where Toronto prices on angles, channels and tees are quoted 4.50 as against 4.00. Other increases include structural shapes up from 3.90 to 4.25; plates, 10 gauge, 4.50 to 4.60; black sheets, 28 gauge, 5.50 to 5.60; cast iron pipe 65.00 to 67.50. There is a slight recession in certain paint ingredients: white lead from 15.00 to 13.25; boiled linseed oil 1.38 to 1.35, and turpentine 1.60 to 1.55. No other changes are recorded.

Estimating the Cost of Carpenter Work

Practical Data that Will Enable the Contractor to Figure on Trim and Interior Woodwork —Tables Showing the Amount of Carpenter's Time for Various Operations

By CHAS. F. DINGMAN,

(Copyright, 1923, by Chas. F. Dingman)

In one of my note books, dating back to about twelve years ago I find some notes which, at that time, satisfied me as "cost-data," and by the help of which I used to make competitive estimates. Here are a few excerpts:—

A carpenter's day's work should equal:

1 complete window, fitted, hung and trimmed,
1 complete door, fitted, hung and trimmed,
5 pairs blinds, fitted and hung.

I am inclined to believe that those "data" are about as complete as any which are available to many estimators even at this late date, yet every one of us realizes that two windows, even though of the same size, may have such different trim that the labor cost on one window will be twice that on the other.

This brings us face to face with the fact that it is just as necessary to figure the labor cost of installing each member that goes to make up a completed window trim as it is for the millwork estimator to take off the quantities in detail. In fact, many contractors' estimators figure the labor-cost of installing the millwork and trim in any building by simply assuming it as a certain percentage of the total millwork sub-bid.

While I do not approve of such methods, if we had a rational means of determining the proper relation between labor-cost and material-cost, and if we could be sure that the millwork estimator had made no mistakes, such a method would be much more accurate than the other method of simply counting up the number of openings and setting an arbitrary price on them.

The percentage method would at least take into account the number of different members involved, while the second method would be a mere guess.

It is hardly within the province of this article to attempt to give a detailed explanation of the method of figuring the cost of mill-work materials, since that is the manufacturer's job rather than the construction manager's, but it will be in order to suggest the methods to be used in taking off quantities and securing prices.

If the materals required are of stock sizes and patterns, it is a simple matter to make a complete list of the items required, price them from a catalogue and discount sheet, or send the list to dealers and have them quote on it.

If the material is only partly of stock patterns, you can price part of the list from the catalogue as above, or send it all out for prices, but if the patterns are at all unusual, it is always best to have the mill estimator take his own qualities directly from the plans.

When sending out lists for prices, it is well to transcribe all those parts of the specifications that describe the kind, size or quality of the different members required. Also note carefully every given dimension of all of the different members required. For instance, window-frames should have dimensions given for outside-casing, pulley-stile, head-casing (also whether square or segment-head), parting-heads, sills, etc. Also complete description of pulleys if any are to be installed. Sash should have dimensions given for thickness and width of stiles and rails, kind of glass and number of lights. Doors should be completely described and, if possible, accompanied by sketch.

Window trim should have dimensions and descriptions of inside-casings, head-casings, stops, stools, aprons, also false-jambs, back-brands, scotia, etc., if required.

Taking off Quantities

There are many methods of procedure used in taking off and listing the quantities, but I find the one that is simplest and most readily checked, to be as follows:—

After having made all of the notes previously referred to, I make headings, thus:—

Basement
  Door-frames
  Window-frames
  Doors
  Sash
  Stair-treads
  (Other items, if any)

After each heading, I put down the number and size of each required, then I go ahead to the

First Floor
  Door-frames
  Window-frames
  Doors, exterior
  Doors, interior
  Sash
  Door-jambs
  Door trim
  Window trim
  Base
  Chair-rail
  Picture mould
  Beam casings
  Beam soffits
  Stair-rail
  Ballusters
  Newels
  Treads
  Risers
  Etc., etc.

Door- and Window-trim is listed by writing down the number of "sides" required. A "side" consists of a complete set of material necessary to trim one side of an opening; thus, an inside door requires two sides of trim, while an outside door or a window requires only one side. Door-jambs are listed by the "set."

If the description previously mentioned is given, any mill estimator will be able to calculate the cost of a side of door-trim or a side of window-trim and will quote accordingly.

Because of the allowances that must be made for waste, few mills will make trim for a 2'-6"x6'-6" door and one for a 3'-0"x7'-0" door. In fact, unless you ordered the casings cut to length and made up in cabinet trim," you would probably receive them in [illegible] or 14-foot lengths, where mitering is not required, and [illegible] lengths if the trim is to be mitered at the head.

Where the bulder is willing to take the extra trouble incurred in handling the materials at the work, he can often buy his mill-work more cheaply by simply ordering a sufficient number of linear feet of casings, stops, plinths, back-bands, window-stools, etc.

Stairs, pantries, cupboards and mantels should be fully described and sketches sent whenever possible.

Approximate Estimating

For approximate estimating, the simplest method is to price your frames, doors and sash from catalogues, then if you cannot readily price the trim in that way, calculate each member into "moulding-inches" and price it at the prevailing price per 100 linear feet per moulding-inch."

You can get that price for different woods from your mill and calculate your quantities by multiplying the dimensions of each member thus:—a ¾x3¼ casing must be cut from a 1x5 board; therefore, it equals 5 moulding-inches. Follow this method through for each member.

When listing mill-work be careful to note whether any priming-coat is to be applied or if any backpainting is to be done at the shop and, when ordering, be sure that you do not have any priming-coat put on any surfaces which are to be stained instead of painted.

You are now ready to attack the labor estimate, and can use the following figures in computing the cost.

The amount of time indicated in these tables, for the several kinds of work, is sufficient to cover all direct labor from the time the materials are delivered inside the building.

Table 1.—Interior Wood-work

Hours of carpenters' time per 100 linear feet

	Soft Woods	Hard Pine	Oak	M'h'g'ny or Gum
Base	4.5	5.7	6.2	6.8
Base-mould	1.7	2.1	2.4	2.6
Floor-mould	1.5	1.9	2.1	2.3
Chair-rail	4.0	5.0	5.5	6.0
Wainscot-cap	3.8	4.8	5.3	5.8
Picture-mould	3.5	4.4	4.8	5.4
Beam-casings	4.5	5.7	6.2	6.8
Beam-soffits	4.5	5.7	6.2	6.8
*Beam-cornice	5.0	6.3	6.9	7.5
*Panel-stiles	7.0	8.8	9.7	10.5
*Panel-mouldings	7.0	8.8	9.7	10.5
Plate-rail	6.5	8.1	9.0	9.8
Plate-rail-apron	6.5	8.1	9.0	9.8

*Add 5 minutes for each miter required.

Note.—To obtain these results, one laborer will be required for each four carpenters; therefore, an allowance of onehour of laborers' time should be added for each four hours of carpenters' time.

Table 2.—Doors and Windows and Trim

Hours per single opening 3'-0"x7'-0" or less

	Soft Woods	Hard Pine	Oak	M'h'g'ny or Gum
Fit sash	4.0	4.5	5.0	
Attach weights and cord	1.0	1.0	1.0	
Attach weights and chain	1.25	1.25	1.25	
Attach sash fasts	0.2	0.2	0.2	
Attach flush lifts	0.3	0.4	0.4	
Attach bar lifts	0.2	0.2	0.2	
Attach pole socket	0.2	0.2	0.2	
Install stops with adjusters	0.5	0.5	0.5	0.7
Install stops with screws	0.4	0.4	0.4	0.6
Install false jambs	1.5	2.0	2.2	3.0
Install casing, stool and apron	4.0	4.5	5.0	6.0
Fit door	3.0	3.4	3.8	4.5
Attach butts (per pair)	0.6	0.8	0.9	1.2
Attach spring butts	1.5	1.7	1.8	2.5
Attach floor hinge	2.0	2.2	2.5	3.0
Attach flush bolts	1.0	1.2	1.5	2.0
Attach cremorne bolts	1.5	1.7	1.8	2.5
Set jambs	1.0	1.0	1.2	1.5
Plant on stops	0.8	0.8	0.9	1.3
Set casings	3.5	3.9	4.5	5.5
Set back bands	1.0	1.2	1.5	2.0
Set plinths	1.0	1.2	1.5	2.0
Add for mitered heads	0.5	0.5	0.6	1.0
Set cap mould	0.5	0.5	0.5	1.
Attach mortise lock	1.	1.2	1.5	2.5
Set transom	1.5	1.7	1.8	2.5
Install transom catch	0.6	0.8	0.9	1.2
Install transom operator	1.	1.2	1.5	2.

Note.—The same addition must be made for laborer's time as in Table 1.

It requires practically as long to perform the work on a smaller opening as it does on one up to 3'-0"x7'-0", but, when the openings get larger, the weight of the materials to be handled becomes so great and the amount of the work to be done is so much that the time allowances must be increased proportionately.

Table 3.—Stair-work

Hours of Carpenter's Time

Note.—Figure all rough carriages for stairs, also all rough stairs, such as are sometimes used for cellar stairs, according to the method delineated for timber-framing but be sure that you make allowance for each carriage, or stringer, each trend and each riser and all necessary cuts).

	Soft Woods	Hard Pine	Oak	Mahogany or Gum
Housing out stringers (per tread and riser)	0.5	0.6	0.7	0.9
Fitting plain rabbeted treads	0.3	0.4	0.5	0.8
Fitting plain plowed risers	0.3	0.4	0.5	0.8
Cutting open stringers (per tread and riser)	0.4	0.5	0.6	0.8
Miter return on end of open stair treads	0.3	0.4	0.5	0.7
Placing scotia per 100 ft.	2.5	3.	3.5	4.5
Placing skirt mould per 100 ft.	3.	3.5	4	5.
Placing skirt board per 100 ft.	5.5	6.7	7.2	7.8
Placing baluster rail each 10 ft.	3.0	3.0	3.5	4.0
Placing wall rail each 10 ft.	1.	1.	1.5	2.0
Placing balusters, each	0.1	0.1	0.1	0.2
Setting newels, each	1.	1.	1.5	2.0

One hour of laborer's time should be added for each eight hours of carpenters' time on stair-work. Because of the nature of the work, the mechanice do not handle as great a volume of material as when on other forms of interior woodwork, so a smaller number of laborers may be employed than on trim.

Table 4.—Miscellaneous Interior Woodwork

	Soft Woods	Hard Pine	Oak	M'h'g'ny or Gum
Placing 4-ft. high "made-up" pannelled wainscot, per 100 ft.	20.	20.	22.	28.
Ditto 6-ft. high	23.	23.	25.	33.
Ditto 8-ft. high	25.	25.	27	35.
Fitting and hanging cupboard doors	0.6	0.7	0.7	1.
Setting drawer cases	1.5	1.5	1.5	2.

It is obviously impracticable to list here all of the various fittings and fixtures that might be introduced under the heading of interior woodwork, but there are very few instances where the work to be done can not be analyzed into its component operations and, having done that, the cost can be calculated from the information given in tables 1 to 4.

Care must always be taken to see that sufficient grounds or blocking have been provided to properly secure all interior woodwork, and all of those items should be included in the estimate under their proper headings, as previously explained.

Where the finish is specified to be hand-smoothed or "bench-sanded," the allowances included in table 5 must be included in the estimate.

Table 5.—Sanding Interior Finish

Hours of carpenters' time per 100 square feet

	Plain	Moulded
Hard woods	1.25	1.50
Soft woods	1.	1.25

Note.—Members under 6" wide should be counted as 6" and all wider than a 6" should be counted as a foot wide or when the actual width is greater than a foot, then their actual width. This is because it takes about as much time to handle a narrow piece as it does to handle a wide one.

Be sure to include as many sides or edges of the member as are to be exposed.

Nails

It would be futile to attempt to compile an accurate schedule to indicate the number of nails required for the various operations included in interior woodwork, but an allowance of two pounds of nails for each one hundred lineal feet of casing, stool, apron, mouldings, etc., will cover all that are actually used, as well as those that are usually wasted.

Table 6.—Exterior Wood-work

Hours of carpenters' time per 100 lin. ft.

Box cornices, each member	3
Open cornices, for each moulding, cut between rafters	5
Corner boards and water table	3
Placing false rafters (each)	0.5
Placing porch posts	2

Note.—The same allowances should be made for the extra cost of miters and for laborers' time as given in Table 1.

Table 7.—Door and Window Frames

Hours of carpenters' time per unit

	Masonry Wall	Stud Wall
Setting single door frames	1.75	1.50
Setting double door frames	2.75	2.50
Setting single window frames	1.25	1.
Setting double window frames	1.75	1.50
Setting triple window frames	2.75	2.50

These costs include necessary bracing, plumbing, attaching anchors, etc.

How Does Paint Affect Illumination?

The Wall Finish is an Important Factor in Determining the Usefulness of Building Interiors—Effect of Color on Reflection of Light—Durability of Paint Films

This paper presented before a section of the Illuminating Engineering Society by R. L. Hallet, briefly discusses the illumination of building interiors, particularly from the standpoint of secondary illumination or the illumination obtained by reflection of light from walls and ceilings. The effect of color and surface finish on reflection of light is discussed, and information is given concerning the reflection properties of paint made with various materials. Durability of paint films as affecting reflection of light is referred to, and the effect of the opacity of pigment as influencing reflection of light is brought out. The results of experiments showing the reflection factors of various kinds of paint and the durability of paints of different composition are given. Information of this character is very useful to engineers, designers and contractors.

The usefulness of the interiors of buildings depends largely on their proper illumination. During the hours of daylight, illumination is often secured by allowing the daylight to enter the building interiors through suitable windows and skylights. During the hours of darkness and, in many cases, during the daylight hours also, it is necessary to depend on artificial illumination.

When we consider artificial illumination, we all realize that the production of artificial light always carries with it a certain cost, whether it be for fuel burned in a power plant or for the purchase of electrical current or gas.

The fundamental thought in connection with illumination, whether it be by daylight or artificial light, involves the utilization of the direct rays of light leaving the source of illumination, which may be the sun, the electric lamp or arc, or the gas flame, and striking that portion of the interior or the objects contained therein which are to be illuminated.

It is a well-known law of light that in case of a source of relatively small dimensions the illumination produced varies inversely as the square of the distance from the source.

In the case of direct sunlight, the decrease in the length of illumination between the window through which the light enters and the portion of the interior which is to be illuminated is very slight, owing to the fact that this distance is but an infinitesimal part of the total distance from the source of light, or, in other words, the distance from the sun.

On the other hand, in considering illumination from an electric lamp or arc, or a gas flame, it is evident that the intensity of the illumination decreases very rapidly as the distance from the source increases. These fundamental considerations, which are very simple matters to illuminating engineers are brought out to show the importance of illumination and the important economic considerations which may be involved.

Secondary Illumination

By secondary illumination we mean light coming from the original source but reflected by the walls and ceilings of the interior in such a way as to be thrown back into the room, thus adding to the direct illumination and, in many cases, placing the light where it is most needed.

Generally speaking, the reflection of light from a surface is determined almost entirely by the color of the surface. This is evidently so because color is the physiological optical impression made on the human eye by the light rays which strike the colored object and which are, in turn, reflected to the eye.

Dark colored surfaces (the limiting color of which as absolute black) absorb a large amount of light which strikes them and do not reflect such absorbed light. Light colored surfaces, on the other hand (the limit of which is pure white), reflect a large amount of the light which strikes them, and such reflected light produces the impression of light colors on the human eye and tends to illumine the space into which the light is reflected.

In the painting of walls and ceilings, there are many questions involved, among which are light reflection, decorative effect, and the durability of the paint film. Under durability, we might include the ability of the paint film to indefinitely remain as a perfect unbroken structural coating, and also we might include the permanency of the decorative effect and the light reflecting properties.

Consideration of Decorative Effect

In this discussion we are concerned principally with the question of light reflecting properties, but we must bear in mind that any paint problem, even if light reflection is of predominating interest, must also include the consideration of durability and decorative effect. From theoretical considerations, as fully substantiated by observation and innumerable tests and experiments we know that a white surface reflects more light than a darker one.

With the paint materials at our command, it is impossible to produce a paint which is either perfectly white or perfectly black. We can, however, approach these limits, and we may also produce various light and dark shades between white and black, varying in light reflecting value in accordance with the shade. It will, therefore, be seen that if we desire high illumination of an interior or the greatest economic utilization of a certain source of illumination, walls and ceilings should be painted white or in the lighter tints, such as light cream, blue, pink, ivory, etc., and if the darker colors are used, we must realize that they should be handled advisedly, and that by their use some of the illumination will be sacrificed.

While it is true that white is the color which has the greatest light reflection, we realize that a white surface is ofen trying to the eye, and, generally speaking, is not suitable for obtaining artistic results where the decorative effect must be largely considered.

Beyond pointing out the difference in light reflecting value of light and dark units, I will not attempt to give definite figures for the different shades and colors, but such figures from fairly reliable sources are available and may be used to good advantage in painting work in connection with illuminating problems.

Surface Finish

There is one other paint characteristic which materially affects illumination, and that is the surface finish of the paint film. By surface finish we mean the degree of gloss or flat which results after the paint has been applied has dried. All degrees of gloss may be secured, varying from a very high gloss to an almost perfect flat. The degree of gloss of the surface finish is obtained by a proper mixture of the materials used in the making of the paint.

Extensive experiments have shown that for paint films of the same color, the total light reflection is substantially the same, no matter what degree of gloss or flat the surface may have. In the case of a gloss surface, the rays of light coming from the source strike the surface and are reflected from the plane of the surface in conformity with the laws of reflection, that is, the angles of reflection will be equal to the angles of incidence. For this reason, the more or less parallel or only slightly divergent rays of light striking a small area of a gloss surface are reflected together in concentrated form, often reflecting the image of the source of illumination, and almost invariably giving high light glare which causes eye-strain. Such concentrated reflection usually produces over-illumination in certain portions of the room, and under-illumination in some of the darker corners. The eye-strain caused by the high light glare usually results in an abnormal contraction of the pupil of the eye which gives the impression of lower illumination than actually exists.

On the other hand, rays of light striking a flat surface are broken up and diffused in all directions so that the glaring high lights are eliminated and the room does not have either over-illuminated or under-illuminated portions. In other words, the total light reflected by a gloss and a flat surface is substantially the same, but the secondary illumination, produced by the flat surface, is better because it is more uniformly distributed. We would point out, however, that a slight suggestion of gloss, sometimes called a slight eggshell finish, is more artistic than a perfectly flat finish, and, practically speaking, has about the same light reflecting properties.

Relative Values of Pigments

In considering light reflecting qualities of paints, the white paints, and the light tints, consisting principally of white paints with a small amount of tinting material, are the most important, as they give the highest light reflection. Some recent carefully conducted experiments have been made to determine the relative light reflecting value of paints made with white lead, Titanox, zinc oxide and lithopone. These white pigments were selected as representing the pigments generally used in the manufacture of wall paints for interior use.

While it is true that some slight differences in the light reflection of various white pigments in the dry form may be detected, the object of these experiments was to determine the relative light reflection value of commercial paint mixtures. Paints of the highest class, in which these various pigments were used, were purchased in the open market. Only paints with the best reputation and selling for the highest price were included, and they were applied to panels in a regular workmanlike manner. The paints were secured and the panels were prepared at the Research Laboratories of the National Lead Company. The light reflection factors were determined by the Electrical Testing Laboratories of New York City.

The results of these tests were as follows:

Kind of paint	Light reflection factor
White lead	0.75 to 0.77
Titanox	0.79
Zinc oxide	0.77
Lithopone	0.75 to 0.78

In the case of the white lead paints and the lithopone paints, a number of samples were procured, but in the case of the Titanox paint and the zinc oxide paint, it was only possible to find one high-grade paint of each kind which contained only the particular pigment in question.

From these figures it will be seen that, practically speaking, there is no material difference in the light reflection factors of the best white paints as first applied, no matter which of the four pigments is used in making them.

Permanency

The next important question is the permanency of the light reflection qualities.

There is more or less dust in the atmosphere in all buildings, and, to a certain extent, dust will adhere to the walls and ceilings of buildings interiors. As the dust is almost invariably of a darker color than the original paint film, the result is not only an unsightly condition, but a material decrease in light reflection value. The adherence of dust is probably not related to paint composition and probably has an equal effect on almost any paint which may be applied.

In the making of a practical paint it is necessary to use certain drying oil vehicles, and it is a well-known fact that all of these vehicles tend to turn yellow after the paint has been applied and has become dry, when the paint is not exposed to sunlight or strong daylight. This, of course, is the condition encountered in many building interiors.

While all of the vehicles yellow to some extent under these conditions, some of them yellow much more rapidly and to a much greater degree than do others. Linseed oil, perhaps the most important and most valuable drying known in the painting art, is, unfortunately, the greatest offender from the standpoint of yellowing when the paint film is not exposed to sunlight or strong daylight.

It, therefore, becomes necessary, in the manufacture of paints for interior use, to use the smallest amount of linseed oil in such paints and to design the vehicles specially to resist the yellowing.

All of the work which has been done on this subject points to the fact that the yellowing of paint films is almost entirely a question of the vehicle, and is not due to the pigment, because by the use of proper vehicles, paints which will satisfactorily hold their color when used for interior work are being made with all of the pigments, and such paints in commercial form are now on the market.

Opacity

As reflection of light is a real phenomenon, it is, of course, influenced by the opacity of the paint film as well as by its color. It is evident that a paint film which transmits the incident rays of light striking it will fail to reflect the light, and the result will be the same, whether incident light is transmitted or absorbed as far as light reflection is concerned.

For this reason, pigments having great opacity give the greatest reflection of light. The opacity or reflecting power of a pigment is largely due to its refractive index as compared to the refractive index of the vehicle in which it is used. Great opacity is obtained by having the greatest difference in refractive index between the pigment and vehicle. Such pigments as white lead, Titanox, zinc oxide and lithopone have a very high refractive index, and the difference in refractive index between them and the paint vehicles is quite great.

On the other hand, such paint materials, sometimes incorrectly called pigments, as barytes, China clay, asbestine, whiting, silica, magnesium carbonate and gypsum, have a comparatively low refractive index, differing little from that of the paint vehicles, and when used with the paint vehicles in the form of a paint film, they almost entirely lose their opacity, and paints made with them (even when they contain enough of these materials to produce mixtures of very heavy brushing consistency) become almost transparent. It will, therefore, be seen that, from the standpoint of light, the use of these extender pigments should be condemned, as they have comparatively no light reflecting properties.

Durability

We would not complete a discussion of paints for any purpose without including the durability of the paint film itself. By durability we mean the ability of the paint film to maintain its original unbroken condition and its firm adherence to the surface over which it is applied. In other words, a paint film should permanently remain a perfect unbroken part of the structure.

Practically speaking, there is little chemical change in dry paint films made with white lead, Titanox or zinc oxide. On the other hand, paints made with lithopone do sometimes show a change due to the oxidation of the pigment itself. You may be interested to know that lithopone is a composite pigment consisting of about 72 per cent. of barium sulphate and 28 per cent. of zinc sulphide. The zinc sulphide is susceptible to oxidation through action of the elements, becoming converted to zinc sulphate, which is soluble in water and, when exposed out of doors, is rapidly washed away by the rain. When applied to interior surfaces, zinc sulphide in lithopone paints slowly undergoes the same oxidation, forming water soluble zinc sulphate, but the action is much slower. As interior walls do not come in contact with rain, the water soluble zinc sulphate is not washed off, but, under some conditions, when the walls are washed to clean them, it will be found that a considerable portion of the paint film has become soluble and is removed. This was brought out sometime ago in a series of tests, where about fifty flat wall paints (being, at that time, practically all of the flat wall paints that were for sale) were applied to an interior wall in an office. At the end of a number of years, washing tests were made by rubbing each of the paints with a damp black cloth. Those paints having a pigment consisting of white lead or zinc oxide showed no water soluble material, but practically all of the paints containing lithopone did not show water soluble material, and the degree to which the pigment could be removed with a damp cloth was in direct proportion to the amount of lithopone contained in the paint.

Effect of Expansion and Contraction

You all know that different substances expand and contract with changes of temperature, metals showing the greatest change in this respect. It may be a new thought that such materials as wood and plaster also expand and contract with changes of temperature, but such is the fact, although the changes are much less than with metals.

Furthermore, wood products and contracts under different atmospheric conditions, and shrinks, particularly across the grain, as it ages. Plaster also shrinks, particularly during the first few years of its life, so that there are real movements of expansion and contraction in wood and plaster surfaces.

If a paint film is to remain unbroken and is to adhere perfectly throughout its life, it must be able to follow the expansion and contraction of the surface over which it is applied. This requires a paint film which retains some elasticity so as to enable it to follow the movements of the surface without rupture and subsequent scaling of the film.

Most of the paint vehicles dry to a film which is relatively elastic. Such is not the case, however, with all of the paint films made up of both pigment and vehicle, as some of the pigments act on the vehicle in such a way as to produce hard and brittle films which tend to crack and scale after they have been applied for some time. It will, therefore, be seen that the production of a durable paint film requires the use of a pigment which will allow the paint to remain sufficiently elastic. Many years of experience have shown that paints made with white lead are pre-eminently satisfactory from this standpoint, as they retain sufficient elasticity throughout their life, and practically always remain as an unbroken film adhering to the surface over which they are applied.

Tests on Fatigue of Mortar

Abstract of Paper Presented Before the Annual Meeting of the American Society for Testing Materials

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Concrete beams are tested in reverse loaded as cantilevers mounted on a rigid column. The specimens were 1:2 mortars in 4x4-in. sections 30 in. long.

There is a progressive deformation in the extreme fibers until failure of the test specimen takes place. A straight line of constant slope relation is indicated up to 110,000 reversals of stress. At this point, four cracks appeared on the outermost fibers of the specimen, and the slope of the line changed. An additional 35,000 reversals of stress were necessary to produce complete failure. The critical point in the progressive deformation cycle is designated as the premature failure limit.

Rupture or failure of the bond occurs first on the extreme outer fibers where the deformation is a maximum. This action is progressive toward the center of the beam until complete failure is imminent. Continual progressive deformation of the outer fibers is significant of the fatigue element. Progressive deformation may occur in some cases for a certain number of reversals when it becomes evident from the flatness of the deformation curve that the material is showing no ill effects from repetitions of the load. The assumption is made that loads producing constant deformation are below the endurance limit or the safe working stress of the material.

Recovery Phenomenon

An interesting feature of the fatigue tests is that of the appreciable recovery during a period of rest of the strength of mortar undergoing a fatiguing action. It has been necessary each night to stop the machine and, as a result, the strength recovery phenomenon is clearly illustrated. A parallel action is common to many materials, such as, metals, wood, and soils when they are stressed beyond a safe limit. The amount of recovery in the case of cement mortar is directly proportional to the duration of the period of rest. It is to be noted that no recovery occurs after the premature failure limit has been attained.

During this series of tests it became necessary to stop the machine for five weeks, and as a result the effect of a prolonged rest period is clearly evident from the trend of the deformation curves. The degree of deformation following the rest period indicates that the beam had fully recovered from the initial overstressings. As these beams were five months old, it is thought that the increase in strength due to age over the rest period exerted a minor influence upon the subsequent resistance of the mortar.

This phenomenon seems to indicate that the rate or number of intermittent applications of load ranging in intensity above the endurance limit would have considerable bearing upon the life of a concrete structure.

Summary

The purpose of the paper has not been to present finished data or to draw definite conclusions concerning the fatigue of mortar and concrete, but more to stimulate interest and discussion of the subject. There are, however, several indications of prominence which are emphasized by this investigation:

1. (a) 28 Day Tests, 12 Beams, 1:2 Mix.—Results of this series of tests indicate that no definite endurance limit between 40 and 60 per cent of that load required to break the beam under a single application can be assigned to cement mortar of this age.

(b) 4 Month Tests, 8 Beams, 1:2 Mix.—Results of this series of tests indicate that the endurance limit is approximately 50 to 55 per cent of the static load.

(c) 6 Month Tests, 6 Beams, 1:2 Mix.—Results of these tests indicate that the endurance limit is 54 to 55 per cent of the static breaking load.

2. The number of reversals of stress necessary to cause failure decreases in a proportion to the respective increase of the percentage of stress above the apparent endurance limit.

3. Stresses above the endurance limit cause continual progressive deformation.

4. Stresses below the endurance limit may cause progressive deformation within certain limits.

(In either 3 or 4, progressive deformation is not significant of permanent injury to the product unless actual rupture of the bond occurs on the extreme outermost fibers.)

5. The effect of a rest period indicates that the rate and number of intermittent applications of load ranging in intensity above the endurance limit would have considerable bearing upon the life of a concrete structure.

6. (a) The amount of recovery in strength in the case of cement mortar is directly proportional to the duration of the period of rest.

(b) Above the premature failure limit no appreciable recovery occurs.

Trade Incorporations

Messrs. Eastdale Limited, with head office at Hamilton, Ont., capital $100,000, to carry on a real estate and building business. It is understood that it is the intention of the company to develop surveys in the east end of Hamilton, Ont.

Ingram's, Limited, with head office at Montreal, Que., capital $20,000, to carry on a business of builders' and plumbers' supplies.

Canadian Construction & Lumber Co., Ltd., with head office at Three Rivers, Que., capital $199,000, to carry on a business as builders and contractors, etc.

Central Engineering & Construction Co. Ltd., capital $50,000 with head office at Toronto, Ont., to carry on a business of builders and contractors.

Hints for the Contractor

Accidents in Handling Explosives

Investigations conducted by the U. S. Department of the Interior through the Bureau of Mines relative to the hazards involved in the handling of explosives indicate that the number of accidents in handling and testing explosives is relatively low; in fact, it is lower than in some supposedly less dangerous occupations. Workers who handle explosives, being aware of the danger, practice carefulness until it becomes a habit; in consequence accidents are relatively few.

Any feeling of nervousness by a man engaged in handling explosives is highly dangerous, as it may result in his dropping a batch of sensitive material or knocking over a piece of apparatus. Men subject to nervousness should overcome it or get out of the industry. All explosives should be treated with proper respect, but it is not necessary to feel that the slightest jar will be disastrous.

The Bureau of Mines estimates that at least 75 per cent. of all the industrial accidents with explosives are caused by hurrying the work and by taking chances where conditions are known to be dangerous; probably 20 per cent. are due to carelessness, the rest having at least fairly excusable causes. The great essential in avoiding accidents is that inexperienced men should be made fully conscious of every movement in handling explosives and should be trained to "play safe" until they are automatically careful all the time.

Liquid Oxygen for Blasting Operations

Recent successful use of liquid oxygen for blasting in mining operations at Pachuca, Mexico, suggests its practicability and economy for certain kinds of excavating operation in engineering construction. In a notable paper presented recently at the New York meeting of the American Institute of Mining and Metallurgical Engineers, M. H. Curlya and G. H. Clevenger give full details of the operations at Pachuca. Their paper is reviewed in Engineering News-Record. Under the conditions the authors find an excellent case for liquid oxygen as compared with the ordinary explosives used in mining.

The production of liquid oxygen explosive is a field operation. It involves the installation of a liquefying plant and the provision of containers and minor apparatus for making the cartridges. At Pachuca the liquefying plant had a capacity of 25 liters per hour and the cost was 2.79c. per pound. With a larger and improved plant it is estimated that the cost could be reduced to 1.86c. per pound. These are operating costs exclusive of capital charges and overhead.

From the plant the oxygen is carried in special flasks to the working face. Here it is poured into other special containers into which the cartridges are dipped and soaked. The absorption process requires about 10 minutes and during this time and in pouring the liquid there is large loss by evaporation. The cartridges are paper cylinders filled with an absorbent—carbon black was used at Pachuca. Once dipped the cartridges have to be used quickly as they become non-explosive in about half an hour. They should be prepared for firing, put in the holes and fired at a certain age in minutes, which differs with different absorbents and wrappers, when their explosive effect is maximum. The explosion is by detonation using ordinary electric detonators. The cost as given in the paper referred to is as follows:

The cost given herewith is computed and stated on the basis of the comparative cost of 40 per cent. gelatin dynamite. These unit costs have been derived from the present operations. Liquid oxygen 2.79c. per pound, carbon-black cartridge 1.38 x 12 in. 1.85c. each, and 1.1 x 12 in. 1.40c. each. The equivalent of 1 lb. 40 per cent. gelatin dynamite requires 2.1 lb. of liquid oxygen and 1.8 cartridges 1.38 x 12 in. and 2.6 cartridges 1.10 x 12 in. The total cost then of L.O.X. equivalent in breaking effect to 1.0 lb. of 40 per cent. gelatin dynamite would be:

2.1 lb. liquid oxygen at 2.79c. per lb.	5.86
1.8 cartridges at 1.85c.	3.33
Total cost, if 1.38 by 12 in. cartridges are used.	9.19
2.1 lb. liquid oxygen at 2.79c. per lb	5.86
2.6 cartridges at 1.40c.	3.64
Total cost, if 1.10 by 12 in. cartridges are used.	9.50

Average total direct or operating cost of, say, 9.35c. per lb. No allowance is made in this for amortization or interest on the capital expenditure for the liquid-oxygen plant and equipment. In other words, 40 per cent. gelatin dynamite would have to be delivered at the mine for 9.35c. per lb. (20.6c. per keg.) to equal the direct costs secured with L.O.X. in an experimental unit.

Summarizing the case for and against liquid oxygen the paper states:

The advantages of L.O.X., which are somewhat the same as those given by various authorities, but with added weight on account of demonstration at Pachuca, are briefly as follows: (1) A substantial saving in cost over the present cost of dynamite. (2) Greater safety, although it is difficult to place a definite monetary value upon this advantage. (3) Freedom from noxious gases, when properly used, renders it possible to return to the working face sooner than when dynamite is used. (4) Small increase in the oxygen content of the air at the working face is an advantage. (5) Although the powder magazine cannot be entirely dispensed with, there is no hazard from the storage of large quantities of high explosives. (6) Entirely eliminates thawing of powder; this is of no consequence at Pachuca but in a cold climate it would be an important advantage. (7) No high explosive in the waste pile or mill bins, for the L.O.X. cartridges become harmless soon after dipping. (8) No danger from drilling into missed holes, for the cartridges are harmless if not detonated soon after loading. (9) No loss of explosive and hazard to innocent persons through theft of explosive. (10)

A reliable and economical method whereby mining companies can manufacture their own explosive. (11) The liquid oxygen can advantageously be used for welding and cutting, also in mine-rescue apparatus.

The disadvantages of L.O.P. are likewise much the same as those that have been previously cited by other authorities. These are: (1) Require additional capital expenditure for liquid-oxygen plant and other equipment. (2) The limitation on the number of holes that can be fired in a single round is a disadvantage in large stopes and drifts. (3) Rapid and uninterrupted loading is imperative. (4) Variations in strength and general characteristics of explosive, owing to constantly diminishing oxygen content. (5) Not as convenient to use, especially in inaccessible parts of the mine. (6) With present technique not feasible to use it in holes having running water. (7) Questionable as to the advantage of using it for shaft sinking. (8) Cannot be used in gaseous or dusty coal mines.

The disadvantages cited are not serious and are more than offset by the advantages.

What is the Ideal Building Code?

The Portland Cement Association Have Developed a Set of Regulations That are Recommended as a Model for Widespread Adoption with Modifications to Suit Individual Requirements

Section 45. Concrete Construction
Unit Stresses and Reinforcement

The following unit working stresses in lb. per sq. in. shall not be exceeded in concrete having an ultimate crushing strength of 2,000 lb. per sq. in:

Steel, structural grade, in tension	16,000
Steel, intermediate grade, in tension	18,000
Steel, high carbon, in tension	18,000
Cold drawn steel wire	18,000
Steel to resist diagonal tensile stress	12,000
Direct compressed on plain concrete piers	500
Direct compression on columns, in concrete alone	500

Compression in vertical reinforcement in columns: Modulus ratio "n" times stress in concrete.

(For computation, steel in spirals of hooped columns may be considered as vertical steel equal to two and one-half times the volume of the spiral steel.)

Extreme fibre stress (in bending) in concrete in compression	750
Extreme fibre stress in concrete adjacent to supports in continuous beams	820
Bond stress, plain bars	80
Bond stress, deformed bars	100
Shearing stress in concrete alone (on the section bjd)	40
Maximum shearing stress where web steel is adequately anchored	120

Where constant inspection of construction is maintained under the supervision of the architect or structural engineer responsible for the structural design, or by some other person acceptable to the Building Inspector, and where the consistency of the concrete is regulated by "Slump* Tests" and the compressive strength of the concrete is checked by frequent tests on cylinders as the work proceeds, the maximum shearing stress in concrete testing 2,000 pounds per square inch or more at the age of 28 days may be 240 pounds per square inch in members having both the web steel and the longitudinal steel anchored mechanically or by means of hooks.

Punching shear in concrete where the depth to reinforcing steel is less than one-fifteenth of the span in beams and slabs, or less than one-third of the overhang of cantilevers and footings may be	120
Where the depth is greater than these limits the punching shear may be	200
Vertical shear on periphery of drop panel of flat-slab floor, measured on depth jd.	60

The concrete used for reinforced concrete construction shall develop an average crushing strength of not less than 2,000 lb. per sq. in. in tests of at least five cylinders 6 inches in diameter and 12 inches high, 28 days after mixing. The samples must be of the same material, consistency and proportions as that used on the work. They shall be taken from the regular batches of concrete and shall be made and stored in accordance with the Standard Method of Making and Storing Specimens of Concrete in the Field, adopted in 1921 by the American Society for Testing Materials,** and tested in a laboratory of recognized standing. The laboratory shall furnish the Building Inspector with a copy of the results of the tests.

Concrete mixtures which develop an average crushing strength greater than 2,000 lb. per sq. in., 28 days after mixing, shall be allowed a proportional increase in unit working stresses in the concrete and in the bond between concrete and steel. If the average strength is less than 2,000 lb per sq. in., a proportional reduction in allowable stresses must be made and the allowable load on the structure must be reduced accordingly. In the absence of definte knowledge in advance of construction, the average crushing strength may be assumed as 2,000 lb. per sq. in. for concrete having one part of cement to six parts of the combined volumes of fine and coarse aggregates (the two classes of aggregates being measured separately), 2,500 lb. per sq. in. for one part of cement to four and one-half parts of aggregates, and 3,000 lb. per sq. in. for one part of cement to three parts of aggregates.

Reinforced Concrete Columns

Reinforced concrete columns having an unsupported length greater than 15 times the least side or diameter of the column shall not be stressed to an amount greater than the quantity 4/3—L/45D mul-

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*The "slumps" for different types of concrete shall be not greater than the following:

Mass concrete	2 inches
Reinforced concrete in thin vertical sections and columns	6 inches
Reinforced concrete in heavy sections	2 inches
Reinforced concrete in thin confined horizontal sections ..	8 inches
Mortar for floor finish	2 inches

Information on the slump test may be obtained from the Portland Cement Association

**Copies may be obtained from the Secretary of the American Society for Testing Materials, 1315 Spruce Street, Philadelphia, or from the Portland Cement Association.

tiplied by the allowable stress specified elsewhere in this section. In this formula "D" is the least side or diameter of the column, and "L" is its unsupported length, both expressed in inches.

For columns subject to eccentric or bending the combined bending and direct stress on the extreme fibre of the gross column section shall not exceed the extreme fibre stress in concrete in compression as specified in this section.

Steel and Cast Iron Columns Encased in Concrete

In steel columns filled with concrete and encased in a shell of concrete at least 3 inches thick, where the steel is designed to carry the entire load, the allowable stress in lb. per sq. in. may be 18,000 70L/R, where "L" is the unsupported length of the column, in inches, and "R" is the least radius of gyration of the steel section, in inches. In no case shall the stress exceed 16,000 lb. per sq. in. The concrete shell shall be reinforced with wire mesh or hooping weighing at least 0.2 lb. per sq. ft. of surface of shell.

When the details of the structural steel are such as fully to enclose or encase the concrete, or if spiral steel is provided equal to one-half of one per cent of the core area and having a pitch not more than 3 inches, the concrete inside the column core or spiral may be loaded to the amount specified in this section for reinforced concrete columns. In addition, the structural steel may be loaded as specified in the preceeding paragraph.

Composite columns having a cast iron core or centre surrounded by concrete which is enclosed in a spiral of not less than one-half of one per cent of the core area, and with a pitch of not more than 3 inches may be figured for a stress of 12,000 60L/R, but not more than 10,000 lb per sq. in., on the cast iron section. The concrete within the spiral or core may be loaded to the amount specified in this section for reinforced concrete columns. The diameter of the cast iron core shall not exceed one-half the diameter of the spiral.

If the unsupported length of columns exceeds fifteen times the least outside dimension, the stress in the concrete shall be reduced as required elsewhere in this section for reinforced concrete columns.

In all columns positive connections shall be provided to transmit to the column steel the loads of all rod-reinforced beams and girders, framed into the columns.

Protection of Reinforced Steel

Reinforcing steel shall be protected by a minimum of 2 inches of concrete on girders and columns, 1½ inches on beams, and 1 inch on floor slabs.

Standard Practice

Features of design and construction not covered by this code shall be governed by the rules and principles of standard practice, as published in the Final Report of the Joint Committee on Concrete and Reinforced Concrete, dated July 1, 1916.

Materials and Supervision

Steel for reinforcement shall conform to the "Standard Specification" for concrete reinforcement adopted by the American Society for Testing Materials. '

Portland cement shall conform to the Standard Specifications and Tests for Portland Cement adopted by the American Society for Testing Materials,** (serial designation C-9-21) effective January 1, 1921.

Fine aggregate shall consist of sand, stone screenings or other inert materials with similar characteristics, or a combination thereof, having clean, hard, strong durable uncoated grains and free from injurious amounts of dust, lumps, soft or flaky particles, shale, alkali, organic matter, loam or other deleterious substances.

Coarse aggregate shall consist of crushed stone, gravel, crushed air-cooled blast furnace slag, or other approved inert materials with similar characteristics, or combustions thereof, having clean, hard, strong, durable, uncoated particles free from injurious amounts of soft, friable, thin, elongated or laminated pieces, alkali, organic or other deleterious matter.

Crusher-run stone, bank-run gravel or mixtures of fine and coarse aggregate prepared before delivery shall not be used without being re-screened and graded.

Water for concrete and mortar shall be free from oil, acid, alkali, organic matter, or other deleterious substances.

The supervision required by Section 26 includes, in the case of concrete structures, a close personal supervision by an experienced superintendent or inspector of the placing of reinforcement, mixing and placing of concrete, and removal of falsework or forms. Especially close supervision is necessary when the temperature falls below 40 deg. F.

Concrete Walls

Plain concrete walls of 1:2½:5 mix or better may be built four-fifths of the thickness of masonry walls in Section 44. Walls of 1:2:4 mix or better may be built two-thirds of the thickness required for masonry walls, but the thickness of basement walls shall be not less than the wall immediately above, and not less than 8 inches.

Walls of reinforced concrete may be of less thickness than required for plain concrete walls if properly reinforced in accordance with the requirements specified in this section for reinforced concrete. If such a wall serves as a required division or fire wall, or as the outside wall of a building required to be of fireproof or mill construction, such wall shall be of 1:2½:5 mix or better, not less than 6 inches thick, and reinforced with steel weighing not less than ½ pound per sq. ft., properly distributed. Such thickness and reinforcement shall be increased where necessary in accordance with standard practice.

Reinforced concrete curtain walls supported at every floor level shall be not less than 4 inches thick.

The separate sections of double or triple concrete walls shall have a combined thickness not less than the thickness required for single concrete walls, but no section shall be less than 4 inches thick. The sections shall be tied together with 3/8-inch round or square galvanized or tar-coated rods, with 2-inch hooks at each end, the rods to be spaced not more than 18 inches horizontally and vertically.

Section 46. Steel and Iron Construction

The following unit stresses (pounds per square inch shall not be exceeded:

Tension, net section, rolled steel	16,000
Direct compression, rolled steel and steel castings	16,000
Bending, on extreme fibres or rolled shapes, built sections, girders and steel castings	16,000
Bending on extreme fibres of pins	24,000
Shear on shop rivets and pins	12,000
Shear on bolts and field rivets	10,000
Shear (average) on webs of plate girders and rolled beams, gross section	10,000
Bearing pressure on shop rivets and pins ..	24,000
Bearing on bolts and field rivets	20,000

	Tension		Compression		Transverse	Shear
	With grain	Across grain	With grain	Across grain	Extreme fibre	With grain
White oak	1,200	125	1,100	500	1,500	150
White pine	700	50	900	200	1,000	80
Long leaf yellow pine	1,200	60	1,500	350	1,700	150
Short leaf yellow pine	1,000	50	1,100	300	1,400	100
Douglas fir	1,000	50	1,300	325	1,600	110
Norway pine	800	50	1,000	250	1,200	100
Eastern spruce and fir	800	50	800	200	1,000	80
Hemlock	600	...	900	200	1,000	80

The stress in compression members shall not exceed C(1-L/60D) where

C = [illegible] with grain

L = length in inches

D = [illegible]

Note.—The above are maximum stresses, suitable for timber which is free from serious defects and of sufficient density.

Defects include decay, knots, shakes, checks, etc. Decay is dangerous [illegible] and because it is difficult to determine the extent to which the timber is weakened. Knots and cross grain in the [illegible] of beams near the bottom edge are especially serious. Deep checks and ring shakes are of importance when they occur in the middle half of the height of the beam or when they run diagonally across the faces; for beams containing such checks, the allowable stress in horizontal shear should be decreased.

The density of the wood is important because the strength of timber increases with the density; this in turn is in proportion to the per cent of "summerwood" (i.e. the hard, dark part of the ring). In yellow pine and Douglas fir the summerwood should form at least 25 per cent of the total if the above stresses are to be used.

These stresses should be decreased at least 20 per cent for timber exposed to moisture.

For further details on the strength and grading of timbers, see Bulletin 108 and other publications of the U. S. Forest Service.

Pressure in pounds per linear inch on expansion rollers shall not exceed 600 times the diameter of rollers in inches.

Axial compression on gross sections of rolled steel or shop riveted columns for ratio of L/R up to 120 may be 19,000-100 L/R with a maximum of 13,000 where L = effective length of member in inches, R = corresponding radius of gryation of section in inches.

Every steel or iron structure shall be designed in accordance with this code and with the rules and principles of standard practice.

All steel or iron shall conform to the standard specifications of the American Society for Testing Materials in force Oct. 1, 1914.

Section 47. Wood Construction
Unit Stresses

The unit stresses in the table above (lb. per sq. in.) shall not be exceeded.

Stud Partitions

Stud in a bearing wall shall be not less than 1⅝ x 3⅝ inches, with the 3⅝ inch dimension at right angles with the plane of the wall. Wooden stud partitions and walls shall be capped with a two-inch plate below the floor joints; or if the studs run through, pieces of studding shall be fitted in between so as to form a fire stop. No lath shall extend through from room to room.

(For "semi-fireproof" stud partitions see Section [illegible].

Furring for Walls

When walls are furred, unless the wall between joists is built out to face of lath, there shall be a continuous horizontal strip placed close to the joist at top and bottom; and before the lathing is done, the wall shall be plastered with a coat of mortar at least 6 inches wide and of the full thickness of the strip, just above or below each horizontal strip. Wooden lath or furring shall not be used in any building of fireproof or mill construction.

Floor and Roof Beams

The ends of all wooden floor or roof beams or joists which rest on a masonry wall shall enter the wall to the depth of 4 inches, unless wall hangers are used, or unless the wall is properly corbeled out 4 inches, in which case the corbeling shall extend to top of joists.

Walls shall be anchored to the floor and roof construction with iron or steel wall anchors placed not more than 8 feet apart.

The ends of all such beams or joists shall be so shaped or arranged that in case of any deflection, or breaking, they may fall out without doing much injury to the brick wall. All joists entering any brick or stone wall shall be splayed approximately 3 inches shorter at top edge.

No wooden beams or other timber shall be built into a party wall nearer than 2 inches to the centre of the wall.

It is reported that a French Company, with headquarters in Paris, are discussing the possibility of establishing a half-million dollar plant at Sault Ste. Marie, Ont., for the manufacture of oxygen and acetylene gas.

What Canada Needs is a National Policy on Fuel

The condition today is that Canada requires certain coal for the upkeep of the country. Canada has coal sufficient for hundreds of years for any population which she might have, within reason or without reason. Unfortunately the coal is at the extreme ends of the country, east and west. The centre portion has become heavily populated and has no coal. One reason for this heavy population is due to industrial work which has grown up on account of its source of coal supply, which has been and is now obtained from the adjacent coal fields of the U.S.

Is Canadian coal to be taken to this industrial centre or shall the industries move to the coal?

What is required, is a national policy on fuel that will be a profit to Canada. The time to put it to operation is now. There was never greater need for it than the present. Canada is at a standstill because there is not sufficient spending money in the country. You cannot send it out of the country and have it too. Everyone talks of Canada's natural resources and the feeling seems to be that they are something which it is wished to save for the future.. There will be no future for Canada unless she uses them. What's the use of money in the stocking while it's in the stocking? Coal in the ground is like money in a stocking. Get it out and spend it.—From "Coal Truths," by Geo. R. Pratt, fuel engineer, Winnipeg.

For the Building Supply Dealer

Stress Price When Selling Hardwood Flooring

Kent Ockley, Limited, Show Prospective Customers How Economical Hardwood Floors Really are Compared with Other Materials

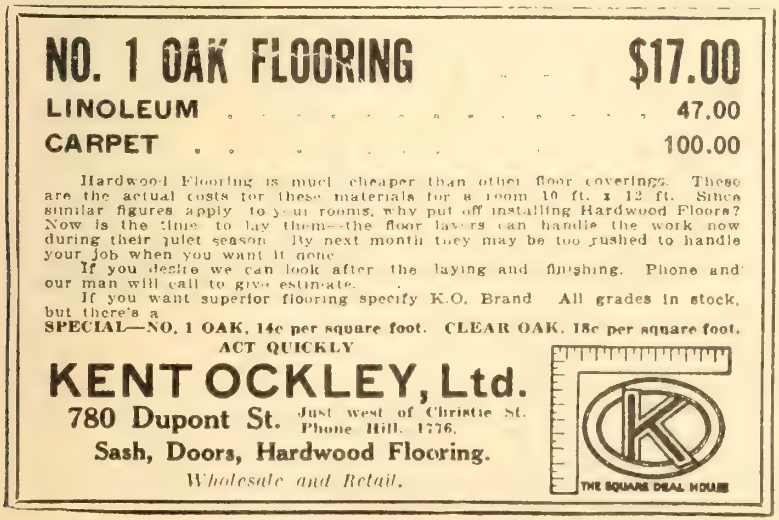
Hardwood flooring is easier to sell today than at any other time. Why? Largely because of the experience of satisfied users. No housewife who has lived in a home where hardwood floors predominate would go back to any other kind. Of course, there are places where special considerations demand the use of other floorings or floor coverings; thus, linoleum might might serve the requirements of the kitchen in a better manner than hardwood, or tile might be more suitable in the bathroom. But, on the whole, hardwood has so many outstanding advantages that it is not difficult to prove its superiority over other types of floor coverings.

Its sanitary features and ease of cleaning at once appeal to the woman of the house. Once having experienced the facility with which the hardwood floors can be kept free of dirt and dust, she will never go back to the dust-laden carpet that cannot, in the nature of things, be sanitary and healthy. But the beauty of the hardwood is what commends itself at once to the appreciative house owner or house seeker. What distinctiveness hardwood seems to lend to a home! What an atmosphere of exclusiveness and superiority! How often, too, the presence of hardwood floors will be the one point that determines the sale of a house to a prospective buyer. Every realtor knows that of two homes, identical in all other respects, the one that is finished with floors of hardwood will be the one that will meet the preference of the purchaser, even though the price is somewhat higher.

With so many talking points in favor of hardwood floors, it is not a difficult matter, then, for the lumber dealer or building supply dealer to sell his hardwood to prospective home builders or even to home owners who wish to modernize their residences by replacing ordinary floor coverings with hardwood.

Many dealers, however, steer clear of the cost features of hardwood flooring. Many a house builder or owner—the majority of them, possibly—thinks that hardwood flooring is a luxury. If he gets to the stage were he can buy it, it is because he has got to the point where his pocket is able to satisfy his longings for something more exclusive. Yet that is far from being the case if owners and dealers only knew it. True, if hardwood flooring were in the luxury class, it would still have merits that would make it worth the extra cost. But as a matter of fact, it is a commodity that compares very favorably in price with other floor coverings—cheaper, indeed, than a good many less satisfactory materials. If dealers would only stress this point they could vastly increase their sales and build up a profitable business. Hardwood flooring is a commodity that sells itself readily. One home well floored becomes the envy of other house owners and thus one satisfied user creates another. So, what the dealer has to do to cash in on this accumulative market is to start the ball rolling. Stress the low price of hardwood flooring and make it seem so reasonable in cost as to be almost a citerion of povery to be without it.

Kent-Ockley Limited, Toronto, manufacturers and dealers in hardwood flooring, as well as millwork specialties, sash and doors, etc., have appealed to prospective customers on this score of low cost. An advertisement which appeared recently in local newspapers shows the nature of their arguments. They make it quite clear that No. 1 oak flooring is cheaper than other floor coverings, and stress this point emphatically. The point of the appeal is that hardwood flooring is so cheap as not to make it worth while to do without it. At only $17.00 for a 10x12 room, how can any home owner excuse himself for not putting in hardwood flooring? The logic of the advertisement is reasonable and there is no doubt but that its arguments carried a great deal of weight with the readers of the newspapers in which it appeared.



NO. 1 OAK FLOORING	**$17.00**
LINOLEUM	**47.00**
CARPET	**100.00**

Hardwood Flooring is much cheaper than other floor coverings. These are the actual costs for these materials for a room 10 ft. x 12 ft. Since similar figures apply to your rooms, why put off installing Hardwood Floors? Now is the time to lay them—the floor layers can handle the work now during their quiet season. By next month they may be too rushed to handle your job when you want it done.

If you desire we can look after the laying and finishing. Phone and our man will call to give estimate.

If you want superior flooring specify K.O. Brand. All grades in stock, but there's a

SPECIAL—NO. 1 OAK, 14c per square foot. CLEAR OAK, 18c per square foot.

ACT QUICKLY

KENT OCKLEY, Ltd.

780 Dupont St. Just west of Christie St. Phone Hill. 1776.

Sash, Doors, Hardwood Flooring.

Wholesale and Retail.

A newspaper ad. that emphasizes the price economy of hardwood flooring

It is the Small Things that Count

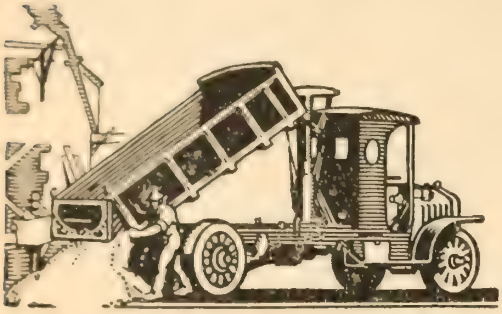
Sell your firm to the public! That is the way to get business, but sales arguments alone won't do it. They are too cold blooded. To be a success at the job of selling your firm to the public you have got to acquire the art of keeping the purchaser's interest in mind. What is meant by this is well illustrated by the following extract of an address by N. A. Berns, publicity manager for a large manufacturer. It was given at a recent meeting of the Indiana Builders' Supply Association:

"Making the goods or the company attractive to the buyer always has been the aim of the seller, but apparently the methods to be used in accomplishing this have not always been analyzed and applied as closely as they might. In our anxiety to sell we some times forget to analyze the reasons why the prospect should buy. The public knows that we want to sell. What it is not always told is where the advantage comes in buying our goods or in buying from us.

"The fundamental applies to all forms of selling and advertising. You remember, when stopping at some particular hotel, that instead of being rudely awakened in the morning, the telephone jingled and a pleasant feminine 'voice with a smile' greeted you with 'God morning. It is 7 o'clock.' At the same hotel you found, upon arising, a copy of the most popular morning paper under your door.

These were small things, but they made a hit with you as a guest. Why? Because they kept in mind that no one likes to be awakened in the morning, that a gentle feminine voice would take some of the curse off this and that you would appreciate a morning paper quickly. You may not stop to analyze the reasons any more than your customers can tell exactly why they prefer to buy from you, but more likely than not, you will stop at that hotel the next time you go to that city. And furthermore, you probably will recommend that hotel to others.

"The reason is that the hotel kept your interests in mind."



Dealers! If You want to Give Real Service

Don't Neglect Your Trucks

Don't Abuse Them and Then Expect Them to Give You Service—Now is the Time to Give Them the Attention They Have Required all Summer

Motor trucks have won the good favor of building supply dealers everywhere. They have so many merits under most circumstances that the dealer who has not got at least one is rare. If these trucks are to give good service, however, they must be looked after carefully and systematically. Perhaps this past season has been hard on them; perhaps your deliveries have been heavy and you have not had an opportunity to have your trucks serviced. If such is the case, don't let your neglect go too far. After a hard season's use your trucks will start to give you trouble if they are not overhauled. They will now begin to overheat and stall, perhaps when you need them most. Therefore, if you value the good service they are capable of rendering you, give them an early "once over" before it is too late. Not much will be required if you have exercised reasonable care all summer, just a few points such as the following:

1—Do you understand the truck's cooling system thoroughly? If not, now is the time to go over it carefully and find out all there is to know about it. See that the flow of water is not impeded by any sort of obstruction and that the overflow pipe is not bent below the level of the base of the radiator filler. Be sure that the overflow pipe is not clogged or flattened.

2—Is the radiator clean? The front of the radiator should be free from dirt, license plates and signs. Also, the back of the radiator should be unobstructed so that nothing will impede the circulation of the air.

3—Are the hose connections water tight and is the hose in good condition? Be sure that the rubber has not been affected during the winter by an anti-freeze solution. Only the best quality rubber hose should be used, as the inside tubing of cheap hose is easily worn away and the rubber particles carried along with the water clog up the radiator.

4—Does the fan turn freely and is the belt tension right? The fan should be clean and its bearings should be well greased. A good test is to turn the fan by hand with the engine shut off. If it is possible to slip the belt easily, but not possible to spin the fan, the tension is right.

5—Is the carburetor choke in proper repair so that it opens all the way? Is the float level correct? If too high, slight flooding will cause an over-rich mixture.

6—Does the ignition system furnish a spark of sufficient strength? A weak spark due to excessive lubrication of the magneto, dirty breaker or distributor, or weak magnets, will have an affect similar to late spark timing and overheating will result.

7—Are the valve tappets properly adjusted? They should have from .008 to .010 inch clearance, which may be gauged by about the thickness of an ordinary post-card.

8—Are the cylinders free from carbon? If not, remove it.

9—Is the oil in the crankcase clean? Gasoline, dirt, or other foreign substances will impair the quality of the oil in the crankcase resulting in overheated parts due to insufficient lubrication. The oil reservoir should be drained every 1,500 miles, the walls thoroughly cleaned, and a fresh supply of oil then be put into the crankcase.

10—Are you using the right grade of oil? Because of the increased temperatures it is often advisable in summer to use a heavy grade of oil.

11—Are the exhaust pipe and muffler clean?

How Can I Increase My Sales?

Service on Rush Orders

The fulfilment of rush orders, from the point of view of the immediate cost of the transaction, doesn't pay. Very frequently the cost of delivery alone far exceeds the amount of the order, especially if the order is for a very limited amount of material, such as a few bags of cement or a few bundles of lath. However, viewed from the larger perspective of future business and well-established goodwill, we have found that we have been handsomely repaid for catering to rush orders. We know from experience that builders frequently get stuck for materials right at an important stage of their operations. If a supply dealer is willing to help him out of his quandary, the contractor is ever in his debt. In our own case we recall several instances where contractors have expressed appreciation of the service we have rendered and the help we have given at times when they found themselves shy of some essential commodities. These contractors, who perhaps had had no dealings with us, saw that we were trying to do them a good turn and they have directed much of their business our way since then.

We make a great deal of the fact that we will fulfill rush orders so far as it is in our power to do so. A special service truck is maintained to care for such demands and we do not hesitate to put this truck to use any hour of the day that a request comes in for such service. The immediate loss which is involved in such a transaction is far outweighed by the future business which we build up and which invariably comes our way when contractors see how willing we are to help them out in times of need—W. J. K.

Participation in Community Parades

The community spirit is very pronounced in the part of the city of Toronto in which our business is located. The merchants of the district have a strong association which has succeeded in inducing the people of the neighborhood to trade at their home stores instead of down town. At frequent intervals these merchants stage community parades under the auspices of the retail association. Prizes are awarded for the best floats and the citizens are urged to participate in the entertainment which invariably follows the parade. Every one of these parades has been an unqualified success. Very few of the people of the community fail to turn out to witness the sight. Indeed, hundreds come from other parts of the city with the result that the merchants of our locality are profitably rewarded by a considerable increase in business.

We ourselves have found that participation in these parades is a splendid business getter. We endeavor to have the best float in the parade and while we may not succeed in winning a prize, we at least have the satisfaction of knowing, judging by comments that are made, that our float was one of outstanding merit. On the last occasion on which a parade was held, a builder came into the office the next day and remarked on the effectiveness of our display and stated that he had always dealt with down town supply firms but that he would like to try our service next time. Our name had come to his attention solely through the float which he had seen the night before in the parade. We know that other business has come to us in just the same way and we fully endorse, as a result, the scheme of community parades as a means of obtaining profitable business in the locality—F. B. McD.

Design of Railway Terminal Stations

The Essential Considerations Concerned in Efficient Station Layout—Anticipation of Electrification—Co ordination of Long and Short Haul Traffic

By ALFRED FELLHEIMER*
Consulting Architect and Engineer, New York

A passenger terminal improvement represents perhaps the largest single expenditure the railroad makes for an individual improvement, and the degree of skill with which it is planned to a great extent predetermines its future as an asset or a liability.

In addition to the obvious railroad necessities, the designer is usually confronted with numerous important conditions, such as the economic soundness of the project and civic or other requirements for the present and future. As each problem presents controlling features peculiar to itself, a plan carried out elsewhere cannot be successfully copied. The designer must, therefore, rely upon his ingenuity, skill and vision in devising a plan which will completely achieve the desired objective and satisfy all requirements with due regard to their relative importance so that when the details have been correctly applied, a vitalized, successful plan will result.

The Creation of the Basic Plan
Preliminary Considerations

The terminal in its broadest sense should provide an efficient instrument of service for the handling of railroad traffic, permit the full utilization of the by-products for revenue, satisfy the requirements of city development, and render public service in the largest measure.

Certain tendencies, such as (1) electrification, (2) relation of rapid transit systems to the long and short haul passenger traffic, (3) merging of terminals, and (4) identity of interest between railroad and community, are controlling elements affecting terminal station design.

Electrification

Electrification within the strictly terminal zone of some of our large cities, has received a distinct impetus in recent years. Its advantages from a purely railroad operating standpoint would not ordinarily be sufficient to justify the scrapping of existing plant and equipment. On the other hand, when the terminal is located in a part of the city which is already desirable or may be potentially so for commercial building development, electrification permits of an intensive use of the property which is not possible with steam operation. The use which may be made of overhead or air rights to produce revenue without serious effect on the operating facilities which may be placed at or below the street level may, in conjunction with such other advantages as electrification may bring to the specific problem under consideration, be sufficient to justify its fixed charges. One of the most striking illustrations of the intensive use of all property in and about a passenger terminal, is the development at the Grand Central Terminal in New York City.

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*Before annual convention of the American Society of Civil Engineers.

Relation of Rapid Transit Systems to the Long and Short Haul Passenger Traffic

As most railroad terminals are inspired primarily by the necessity of providing for long-haul passenger traffic, the handling of short-haul (suburban) traffic should not be allowed to become a limiting factor in the life of the terminal. Suburban traffic generally develops faster than through traffic and often threatens to absorb an undue proportion of the terminal facilities. This situation is aggravated by the modern tendency of long-haul through travel to attain its peak load coincidently with the short-haul peak.

Serving nearby suburban or urban traffic is logically the function of rapid transit systems, which have in general failed to keep pace with the unprecedented growth of many of our large cities. In consequence, an undue share of this traffic is forced into the railroad terminals.

To the extent that the volume of this nearby suburban or urban traffic is reduced its terminal service facilities may be restricted, unremunerative business eliminated, and capital expenditure lessened, making available more space and capital, if needed, for greater development of the long-haul terminal service.

In view of these circumstances, it is clearly an advantage to divert as much as possible of the urban and nearby suburban traffic from the terminal, consequently, definite consideration should always be given to the feasibility of arranging or providing for co-operative trackage rights and physical connections between railroad and rapid transit systems, existing or proposed, outside the terminal limits, thus assuring relief of the terminal from the burden of this concentrated service, and affording the public in the greatest degree door to door transportation.

Merging of Terminals

As serious public thought is now being given to large consolidations of railroad properties, consideration sould be given to the anticipation of them and the changes involved in their accomplishment, including merging of terminals.

This involves broad questions of policy and economics of operation. The value of the land which may be released is often one of the major points advanced in favor of such a project. Before deciding in its favor, however, due weight should be given to the possibility, under electrification, of the railroad use and commercial development jointly, through the utilization of the air-rights thereby made available.

It has been demonstrated that, given the opportunity, business activities will center about an electrified railroad passenger terminal, to take advantage of the accessibility of transportation and the potential business possibilities created by the movement of large numbers of passengers through the various approach thoroughfares. In addition the desirability of the air-right space is increased by the continuous control of a single ownership.

Through the mutual reaction of these favorable elements, it is not unlikely that the values thereby created will be far greater than those following the full release of the same property for non-railroad use.

Identity of Interest Between Railroad and Community

In principle, the interests of the railroad and the community it serves are in the last analysis the same, and the terminal plan should express such identity of interest.

Municipal and other public officials should therefore approach the solution of these problems as far as the elements they themselves represent are concerned, in the spirit of whole-hearted co-operation. And so too, the railroads, not only as concerns the public interest but also as between themselves where the terminal project affects directly or indirectly more than one railroad.

General Requirements

The preliminary examination must determine that the project satisfies the following conditions:

That the improvement at the proposed site as compared with other available locations, is desirable from the viewpoints of construction and operating costs, including car unit costs. This is particularly important for locations so restricted in area that double-deck structures may be necessary to secure required capacity.

That suitable development can be made in stages to meet the expected normal growth in the services involved for a sufficient term of years to justify the project.

That the proposed improvement is desirable from the viewpoint of the municipality and in harmony with its plans for development.

That the advantages offered to the public are sufficient to justify such concessions as may be required from the municipality.

That the project in its entirety, presents a sufficiently favorable economic aspect, free from insurmountable prior obligations, to insure its complete financing along rational lines.

That the by-products of the development such as the overhead or air-rights can be utilized in a practical and profitable way so as to absorb, or at least substantially reduce, the carrying charges of the improvement.

That the project as planned is so sound and free from imposing burdensome conditions upon the railroad, that controlling or governing bodies will readily approve same.

That the improvement is of such type that adequate enhancement of land values within the terminal area will necessarily follow.

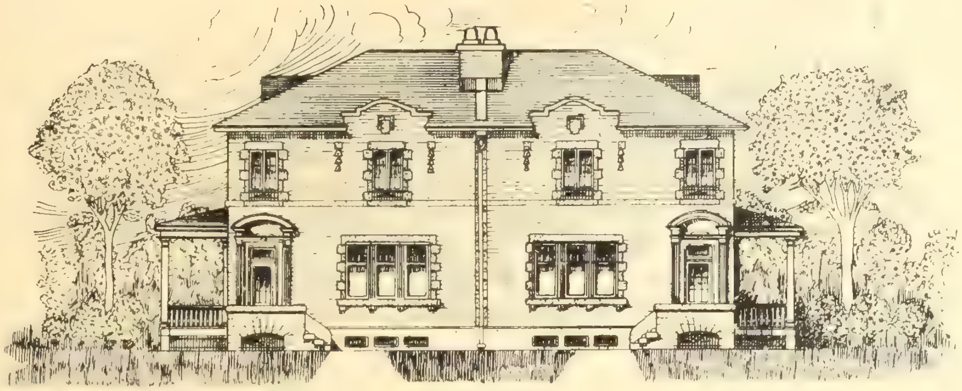
Specific Requirements

The foregoing broad principles being satisfied, the basic idea must be in harmony with the following:

Transition from Existing Conditions to Proposed Plan.—Except at new locations, the plan must, in its general conformation, fit in with existing conditions to a sufficient extent to permit of gradual transition into the complete or final plan without serious disturbance of operation, and in such stages as will conform with the development of railroad traffic and contiguous property. Obvious economic and practical reasons make this imperative.

Balance Between Benefits to Public and Cost.—It must strike a proper balance between the public comfort and convenience on the one side, and economy in both first cost and subsequent operation on

The Contract Record's
Weekly House Suggestion No. 80

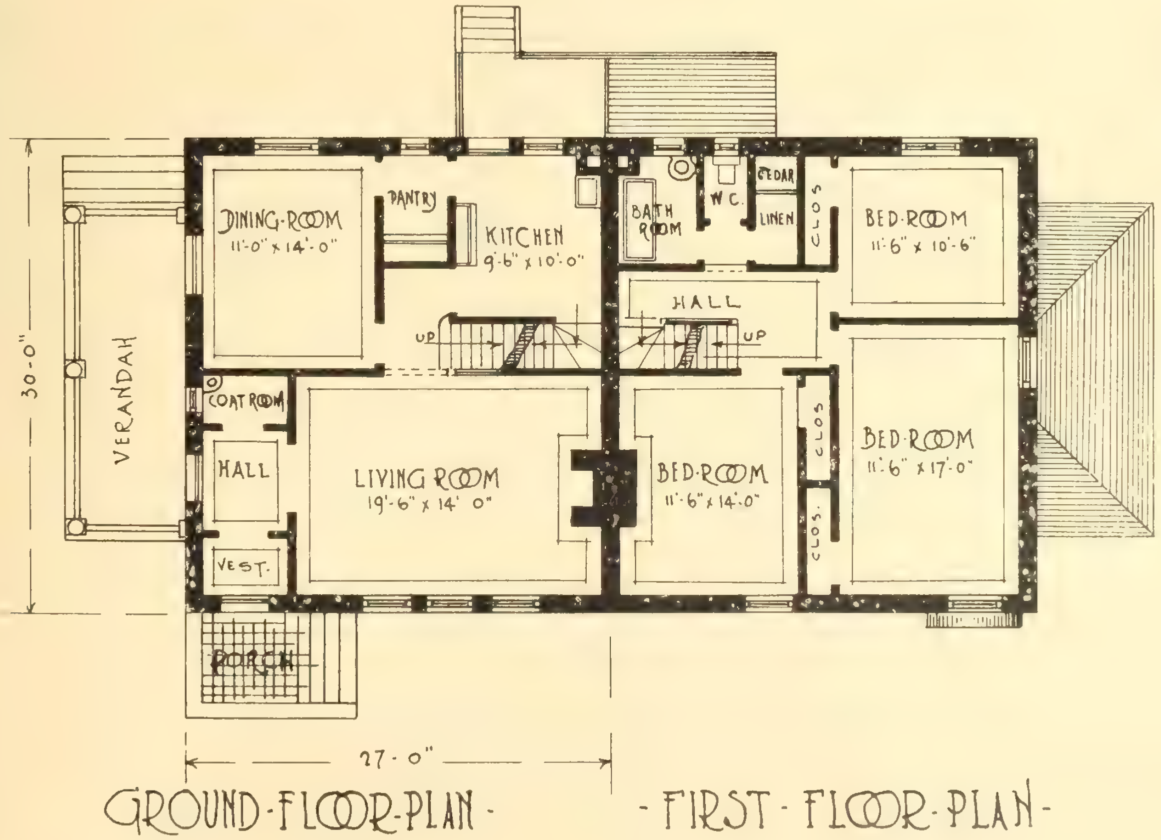


We are showing this week the plans of an attractive double house built at Montreal recently. Each residence measures 30 x 27 feet and comprises a large living room, dining room and kitchen on the ground floor. The stairway opens off a small hall between the dining and living rooms. There are three bed-rooms on the upper floor, each provided with spacious wardrobes.

The foundations of the house are concrete 12 inches thick resting on 2 ft. footings. The walls are brick veneer and the roof is covered with asbestos shingles. All interior woodwork is B.C. fir, and the floors are of spruce with a hardwood border. The entrance doors and windows are ornamental with artificial stone.

The cost of the house was $15,000 and includes a hot air heating system.

Mr. J. A. T. Houle, architect of Montreal is the designer of these attractive residences.



the other. This insures good will on the part of the public and efficient and liberal service on the part of the railroad.

Simplicity of Plan Insuring Directness.—The general layout must be orderly and direct in the placement of its principal parts, because in a project of large dimensions and scope, freedom from disorder and confusion is in direct proportion to the simplicity of the plan.

Street Arrangement and Railroad Facilities Coordinated.—The railroad facilities provided must coordinate with the complete develpment of streets and blocks throughout the terminal, conforming with the civic plans for unrestricted expansion of the city adjacent to or across the terminal area. This will benefit both the railroad and the public.

Flexibility in Adjustment to Future Requirements.—Facility of adjustment to future requirements must be arranged for, because the useful life of railroad facilities is limited by obsolescence rather than by physical decay. Such facilities, therefore, can be considered stable or permanent only insofar as they are adjustable to changing conditions. This applies with special force to terminals which must, in their initial stages, be operated by steam.

Adequate Trackage in Approaches, Throats and Yards.—Definite determination must be made of the adequacy of approaches, throats and yards, to assure ample capacities of trackage, all in proper balance, thereby making possible a high degree of operating effectiveness.

(To be Continued)

Mainly Constructional

East and West—From Coast to Coast

Building permits issued by the city architect's department in North Toronto up to the end of July, amounted to almost $5,000,000 as compared with a total of $6,000,000 for the whole of last year. During the month of July, however, the permits totalled only $506,000, which is below the amount issued the previous month when the aggregate was $875,900.

It is reported that negotiations which have been instituted for the acquisition of a large area of land at the foot of Bathurst street, Toronto, Ont., may lead to the establishment of another industry on the water-front property early next year.

The Great Lakes Pulp & Paper Company are reported to be preparing plans for the erection of a factory at Fort William, Ont., which will cost in the neighborhood of $3,000,000.

Plans for a $500,000 ice arena at Brantford, Ont., are being prepared. The building will be four stories high, with stores, offices and suites.

It is reported that the Provincial Government intends to construct a block of departmental buildings on the east side of Queen's Park, Toronto, Ont. Rough plans for a six storey structure have already been drawn up.

The erection of a post office at Riverside, Ont., is expected to start soon.

The erection of a new federal building is contemplated at Windsor, Ont.

Work is to start at once on golf links at Port Burwell, Ont. 200 acres will be sub-divided for cottage sites; 2 cottages now being built.

It is reported that Messrs. Firstbrook Bros. Limited, have purchased a piece of land, 330 x 301 feet, on the west side of Caledonia road, 200 feet north of St. Clair avenue, Toronto. It is understood that they will erect a factory and manufacture builders' requisites.

Personal

Cyrus A. Bridge, vice-president of the Steel Company of Canada, Hamilton, Ont., has been elected president of the Bank of Hamilton, succeeding the late Sir John Hendrie.

Mr. Charles Warnock of Montreal, has been elected president of the Robt. W. Hunt Co., Limited, inspecting and testing engineers, Montreal, Que., succeeding the late Robert W. Hunt.

Mr. C. A. Bourdeau, 195 St, Catherine St,. E., Montreal, Que., represents Buyers Door & Manufacturing Co., Ltd., 374 Pacific Ave., Toronto, Ont.

Messrs. Sharp & Horner, architects, 73 King West, Toronto, Ont., have dissolved partnership. Mr. Herbert Horner will continue the business at the above address.

Mr. Sharp, late of Sharp & Horner, has left Toronto to take up permanent residence in Los Angeles, Calif.

Obituary

A recent report from Chicoutimi, Que., states that Mr. Edmond Tremblay, a well known contractor of that town, was instantly killed when he fell from the roof of the cathedral where he was in charge of the repair work.

The death recently occurred of Mr. John Laxton, Sr., at his home, 1457 Queen W., Toronto, Ont., in hs 78th year. Mr. Laxton was connected with the Consumers' Gas Co. and a member of the Toronto Harbor Commissioners.

The death recently took place of Mr. D. A. Niven, O.L.S., at his home in Guelph, Ont. Mr. Niven was a very well known land surveyor in the Province.

Robert Woolston Hunt, president of the Robt. W. Hunt and Co. Ltd., Montreal, died recently at his home in Chicago, at the age of eighty-four. Mr. Hunt was born in 1838 in Fallsington, Pa., U.S.A. He spent several years learning the practical side of iron making, and later took a course in analytical chemistry. Upon the completion of this he entered the employ of the Cambria Iron Company, of Johnstown, Pa., and in 1869. he established for them the first laboratory in America as a direct part of an iron and steel organization. Later he was sent to the works at Wyandotte, Mich., where experiments with the new Bessemer process of making steel were being conducted. He was placed in charge of the experimental works and so continued until May 1866, when the Cambria Iron Company called him back to Johnstown to take charge of its steel business. It was at the mill later, and largely under Mr. Hunt's direction, that the first commercial order for steel rails ever made in America was rolled.

Later, he assisted in designing and building the Bessemer works of the Cambria plant and in 1873 he became superintendent of the Albany & Rensselaer Iron & Steel Co. During his years of active connection with steel-rail manufacture he almost completely rebuilt the various works of this company and he also patented many details of iron and steel metallurgical processes and machinery, including in conjunction with others, the first automatic rail mill tables.

In 1888 he removed to Chicago, and established the bureau of inspection, tests and consultation now known as the Robert W. Hunt Company.

Mr. Hunt was a member of numerous technical societies and had been president of many of them. In 1912 Mr. Hunt was awarded the John Fritz medal for his contributions to the early development of the Bessemer process.

CONSTRUCTIONAL ACTIVITY

Period of August 15 to August 21, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Crystal Beach, Ont.
Considerable addition to the sewerage system is contemplated and tenders for the work will shortly be called. Messrs. Ross & Scott, Welland, Ont., are the engineers.

Kincardine, Ont.
The town council will secure plans and estimates for the laying of concrete pavements on Russell square and Queen street, east.

Port Dover, Ont.
Tenders being received by James Sloan, clerk, till August 27 for 14,000 cu. yds. of pavement and 2,000 lin. ft. curb and gutter. Plans and specifications with Guy Marston, engineer, Simcoe, Ont.

St. Lambert, Que.
Tenders being received by J. R. Beatty, secretary, till August 27 for laying 1,930 ft. of 30 in. concrete pipe from water works to a point in St. Lawrence river opposite 4th pier of Victoria Bridge. Plans and specifications with J. Kellett, engineer.

Verdun, Que.
Work will start shortly on grading and macadamizing streets, estimated to cost $26,000.

The work of paving several Sts. to cost $45,000 will shortly be started.

Work is to start shortly on extension to waterworks system to cost $12,000. No materials purchased.

Walkerton, Ont.
At a meeting of the ratepayers recently an expenditure of $20,000 was sanctioned for certain improvements to the waterworks system.

CONTRACTS AWARDED

Aylmer, Ont.
The town council has awarded the contract for sewers on Raglan and South Sts., to William Buck and work will start at once. Prices wanted on 8 in. and 10 in. sewer tile.

Arborg, Man.
J. T. Jonasson, Riverton, Man., has been awarded the contract for roadwork.

Beauce Jct.-Sherbrooke route, Que.
Messrs. Lemieux & Roberge, Ste. Marie, Co. Beauce, have been awarded the contract for refection of roads as follows: Amiante village—$7,651.06; Thetford Twp.—$13.221.76; St. Antoine de Pontbraind Parish— $14,350.00; Robertson Village—$10,458.70.

Flos Twp., Ont.
The town council has awarded Chas. Vanstombronock, Blenheim, Ont., contract for drainage work at $12,000.

Fort William, Ont.
J. J. Flanigan, Cochrane, Ont., has been awarded the contract to build a $50,000 sewage disposal plant.

Golden, B. C.
W. Tierney & Co., Vancouver, B. C., have been awarded the contract for 1½ miles of highway from Yoho Park to Golden, to cost $45,465.

Hamilton, Ont.
The city council has awarded the following contracts for pipe sewers; Stapleton St.—J. D. Armstrong; Cumberland St.—Scanlon Moyer Ltd.; Marion Askell, Pailey and North Oval Sts.—McLaughlin Bros.

Levis-Rimouski & Quebec-St. Simeon Highway, Que.
Contracts have been awarded for roadwork as follows: Giffard Village—Ls. Zuanetti, Pointe-a-Pic Co., Charlevoix, at $14,945.62; Lauzon—T. E. Rosseau Ltee., St. Valier St., Quebec, Que.. at $217,000.

Levis-St. Lambert Highway, Que.
Nap. Trundel, St. Irenee, is the general contractor for 30,506 feet of macadam road at $95,768.

Midland, Ont.
The dredging to be done this year in Midland harbor has been awarded to Messrs. Light and Carson.

Saskatoon, Sask.
R. J. Arrand has received the contract for laying concrete sidewalks to cost $15,000.

St. John Co., N. B.
James E. Kane, Pugsley building, St. John, N. B., has received the contract for 2.1 miles of highway, Kanes Corner to Silver Falls.

Toronto, Ont.
Grant Contracting Co. Ltd., have received the contract for laying sewers on Chaplin crescent.

Walkerville, Ont.
The town council has awarded the contract for paving, $8,509.95, to Merlo, Merlo & Ray, Ford, Ont.

The contract for road paving has been awarded to Merlo, Merlo & Ray, Ford, Ont.. at $59,040.51.

Railroads, Bridges and Wharves

Laprairie, Que.
Tenders being received by J. A. Sicotte, secretary, till August 28 for building of bridge "Portage" at Cote St. Catherine. Plans and specifications with secretary.

Markham Twp., Ont.
Tenders for the erection of a steel bridge have been received by the township council.

Sorel, Que.,
Tenders being received by R. C. Desrochers, secretary, Parliament Buildings, Ottawa, till September 4 for 200 ft. concrete construction of high level wharf.

Windsor, Ont.
The department of Public Works has approved the plans of the Detroit and Windsor Ferry Company for the construction of new docks in the Detroit River.

CONTRACTS AWARDED

Birtle, Man.
Wm. Newman Co., Ltd., Winnipeg, Man., are the general contractors for $4,468 bridge and culvert to be erected.

Holland, Man.
Contract for $3,367 concrete culvert has been awarded to Kelly & Kimberly, Kenora, Ont.

Montreal, Que.
The following contracts have been awarded in connection with marine tower jetty and transit sheds; Atlas Construction Co.—marine tower and jetty; Quinlan, Robertson & Janin—transit sheds.

Prairie Siding, Ont.
Kent county council has awarded the contract for $120,000 bridge over River Thames, to Wm. Bermingham & Son, Kingston, Ont.

Ste. Julienne Parish, Que.
The town council has awarded Albert Brouillette, St. Esprit, Que., the contract for building reinforced concrete bridge, 35 ft. long, at $6,700.

St. Joachim de Chateauguay, Que.
Wilfrid Coulin, Marieville, Co. Rouvlle, is the general contractor for steel bridge being erected at $42,700; superstructure— Dominion Bridge Co. Ltd., Lachine, Que.

Ste. Croix, Que.
Contract for building iron bridge has been awarded to Messrs. Boucher, Aubin & Beaudet, general contractors, St. Antoine de Tilly, Que., at $16,458. Length of bridge, 140 ft.

Public Buildings, Churches and Schools

Cherrywood, Ont.
Tenders being received by Gay Co. Ltd., Bruce St., Oshawa, Ont., for plumbing, electric and heating trades for addition to school. No closing date set.

Ford, Ont.
Ernest Clarke, Ltd., 200 Banwell Ave., is submitting tender in connection with $210,000 school to be erected near Drouillard Rd., and wants prices on sub-trades.

Kitchener, Ont.
Tenders have been received for alterations and addition to House of Refuge on Frederick St.

London, Ont.
The building of a $600,000 city hall is

ntemplated. G. A. Wenige, mayor, is receiving competitive plans and specifications from local architects till September 1.

Montreal, Que.

Excavating has started for the erection [illegible] at Lavel de Rapids [illegible] contract will be [illegible] 10 days.

Plans are to be prepared for the building of a pedagogical institute on Claremont Ave., for the Rev. Sisters of Congregation of Notre Dame, Sherbrooke St. W. Architect—L. A. Amos, 78 Crescent St.

Niagara Falls, Ont.

The Toronto, Niagara & St. Catharines Rly. Co., is having plans prepared for a terminal building. Architect—J. Schofield, care Engineer of Standards, C. N. Rly., Montreal, Que.

Point Grey, B. C.

Building of a $5,500 G.W.V.A. memorial hall is to start at once; 1 storey, 61 ft. 6 in. x 61 ft. 6 in.; frame construction. Architects are Sharp & Thompson, Vancouver, B. C.

Quesnel, B. C.

Tenders for the erection of an $11,000 hospital will be received by the hospital board till August 25. 2 storeys, 30 x 67, frame construction. Plans and specifications with architects and hospital board. Architects—Blackadder & McKay, Vancouver.

Quebec, Que.

Plans are being prepared for the erection of a $500,000 hospital on Ste. Foye Road; rchitects are Beaule & Morrissette, 21 D'Aiguillon St.

Plans are being drawn for a forestry school on Ste Foye road; 4 storeys, 54 x 180, stone and brick construction; architects—Bergeron & Lemay, Quebec, Que. Tenders will be called in about two weeks.

The work of rebuilding basilica at a cost of $500,000 is now in progress. Tenders being received by architects, Messrs. Tanguay & Chenevert, 20 D'Aihuillon St., till August 25 for steel sash and glazing.

Simcoe, Ont.

Tenders will be called shortly for the erection of a $14,000 memorial hall tower.

St. Antonin, Que.

Napoleon Berube is the general contractor for extension to church at a cost of $30,000.

St. Leon De Standon, Que.

The walls are going up in connection with $48,000 church being built; 55 x 160; stone and stucco construction. No sub-trades let.

Timmins, Ont.

The time for receiving tenders on high school has been extended to August 27th. Pennington & Boyde, Windsor, Ont., Architects.

Thorold, Ont.

Plans are being prepared for the erection of a $60,000 school; architects—Nicholson & MacBeth, St. Catharines, Ont.

Toronto, Ont.

Tenders have been received by the Rhodes Ave. Baptist church for the erection of a $15,000 Sunday school; 1 storey, brick construction; architect, Percy Lee, 7 Leslie St.

Westboro, Ont.

Plans for a $30,000 hall and temple are being prepared for the Westboro Masons. 2 storeys, 94 x 48, brick construction. The architects are Richards & Abra, Ottawa, Ont.

Wolfville, N. S.

Tenders being received by architect, L. R. Fairn, Aylesford, N. S., till August 28 on all trades, except heating and electric, on main building only of Auditorium and lecture rooms estimated to cost $100,000.

CONTRACTS AWARDED

Chilliwack, B. C.

R. H. Brock, Chilliwack, B. C., is the general contractor for $9,000 nurses' home to be erected; 2 storeys, 34 x 38, frame construction.

Montreal, Que.

The following sub trades have been let on $35,000 church being erected for the Church of England; electric—Vincent & Say Electric Co.; plumbing—Peattie Bros.

The stone work for the new city hall is now going up. J. A. Durocher, 291 Chambly St., has received contract for roofing and floors at $239,000.

The foundations are in for school being built on Cote St. Paul and the following contracts have been awarded:— structural steel—Dominion Bridge Co., Ltd.; ornamental iron—Federal Iron Works.

The foundations are going in for Parish St. Pierre Claver school The following sub-trades have been let; sash and doors— Mr. Pelland. St. Elizabeth, Que.; electrical work—W. Rochon; slate, marble and tiling—E. LePage.

Montreal North, Que.

The following sub-trades have been let on $37,000 home "House for Religious.' General contractors—Ovila Fillion & Freres; roofing, plumbing and heating—Turcot Ltee.; electric—J. A. St. Amour; plastering— Frs. Beaudoin & Fils.

New Waterford, N. S.

John S. McDonald is the general contractor for $12,000 addition to Central public school; 2 storeys, 24 x 66, frame construction, 4 rooms.

Niagara Falls, Ont.

Work is to start at once on repairs to Hospital on Jepson St.; electrical work—Arthur Green, 12 South St.; plastering—Bert Cullum, 5 McGrael Ave. Tenders are being received for redecorating this portion of hospital building.

Outremont, Que.

The following sub-trades have been let on $66,000 school "Lajoie;" roofing—M. Chouinard. electric— J. A. St. Amour; plastering—G. Rochefort; painting and glazing— Birch & Drouin; ornamental iron work—Gravel & Drouin.

Oshawa, Ont.

The following sub-trades have been let on $35,000 church tower being built for St. George's Anglican church; masonry—H. N. Dancy; carpentry—E. E. Woodley; paintng—Jos. McCausland; roofing— Ball & Baker. All of Toronto.

Prince George, B. C.

Work is to start at once on remodelling hotel for court house at a cost of $19,650. The following contracts have been let: general contractor— McInnis & Wilson; plumbing— Harper-Cross Co.; painting—Cyril Lupree. Masonry, electric, heating and plastering trades not yet let.

Quebec, Que.

The following contracts have been awarded in connecton with $75,000 Refuge being erected on Ste. Foye Road; masonry and carpentry work— C. A. Vezina; electric, plumbing and heating—P. P. Giguere Cie. Ltee.; roofing—Eugene Filardeau; painting and glazing—L. A. Bedard, care architects, Tanguay & Chenevert.

Quebec, Que.

The following sub-trades have been let in connection with $260,000 extension to court house; masonry work—Emile Frenette; carpentry—Emile Morrissette; roofing—Eugenne Falardeau; painting and glazing—Marier & Tremblay Ltd. Tenders will be called shortly on electrical work, plumbing and heating.

Selkirk, Man.

Goldie & McCulloch Co. Ltd., Winnipeg, Man., have been awarded contract for water tube boiler at $6,120, to be installed in the Hospital for Mental Diseases.

Scarboro Twp., Ont.

Work is to start soon on $80,000 addition to collegiate for the China Missons Corporation, Kingston road. The following contracts have been awarded: masonry work—N. H. Dancy & Son, Ltd.; carpentry work— H. T. Hicket Construction Co.; steel—Hepburn & Disher. Roofing, painting, plumbing, heating, plastering and electrical work to be let.

Three Rivers, Que.

The contract for heating $50,000 school being erected has been awarded to A Dube & Cie., Limited.

Viscount, Sask.

Fillion & Lindstrog Co. Ltd., are the general contractors for school being erected for St. Alphonse Separate School.

Vancouver, B. C.

The work of remodelling club quarters north east corner Burrard and Pender Sts., is to start at once. A. W. Pemberton, 3680-11th Ave. W., is the general contractor.

Verdun, Que.

Excavating for $50.000 addition to St. Clements Anglican church has started. Messrs. Jas Shearer & Co. are the general contractors.

Woodstock, Ont.

The Board of Education has awarded the contract for addition to Central public school to W. J. Taylor, contractor, at a cost of $52,420. The new addition will contain eight rooms and will be ready for occupation early in November.

Winnipeg, Man.

The following sub-trades have been let in connection with $132,000 addition to nurse's home. millwork—Radford-Wright Co. Ltd.; plastering—T.Edeardes; painting and glazing—Taylor Painting & Decorating Co. Ltd.. reinforced steel—Cowin & Co. Ltd.

Windsor, N. S.

C. V. Norris has been awarded the heating contract for $15,000 church school for girls..

Wynward, Sask.

Work is to start shortly on addition to school to cost $19,910. The general contractors are Miners & Ball, Ltd., Saskatoon, Sask.

Windsor, Ont.

Abbott & Gray, 207 Gladstone Ave.

are the general contractors for $13,000 church being erected on Parent Ave.; 2 storeys, 34 x 46, brick veneer construction. Electric, plumbing, plastering and painting to be let.

Waterloo, Ont.
Gus. Donner, Kitchener, Ont., has the painting and glazing contract for $40,000 college being erected.

Business Buildings and Industrial Plants

Cowansville, Que.
Work is now in progress on extension to factory for the Premier Silk Mills Co., to cost $50,000; 1 storey, 300 x 500 frame and brick construction.

Ford City, Ont.
Tenders on plumbing and heating of heat treat building owned by the Ford Motor Co. of Canada, Ltd., have been received.

Hamilton, Ont.
C. R. Tullock, 120 Kenilworth, is the owner and general contractor of store and apartments to cost $12,000 being erected on Kenilworth Ave.

Montreal, Que.
Tenders have been received by St. Catherine Parish for the erection of a business block, corner Amherst and Sobin Sts.; 4 storeys 75 x 60; architect—Jos. Sawyer, 407 Guy St.

Nelson, B. C.
Tenders have been received for the erection of a $25,000 masonic temple on Baker St.; 2 storeys, 40 x 70. Architect —Alexander Currie, Nelson, B. C.

Oshawa, Ont.
Tenders being received by J. L. Whattam, 176 Simcoe St., south for all trades, except heating and electric, on curling rink to be erected. 1½ storeys, 181 x 84, brick construction. No closing date set. Plans and specifications with MacLean Building Reports Ltd., 345 Adelaide W., Toronto.

The walls are now going up for an $18,000 printing office for Alger & Sons, King St.

Ottawa, Ont.
Plans are being prepared for a $17,000 apartment to be erected at corner Clarence and Cobourg Sts.; architect, R. Rouleau, care owner, Asias Sauve, 38 Rideau St.

Oxford, N. S.
A. E. Smith is the owner of a $10,000 theatre being erected here.

Penticton, B. C.
Work is to start at once on $9,500 fruit warehouse; 1 storey, 94 x 100, frame construction. Penticton Co-Operative Grower's Assn. are the owners and builders.

Skidegate Inlet, B. C.
Plans are being prepared for a $100,000 sawmill for the Pennsylvania Syndicate, Kagan Bay, Skidegate Inlet, B. C.

Toronto, Ont.
Work is to start shortly on stores and apartments, $7,000, east side Woodbine Ave. near Savoy. W. Gearing, 84 McMichael Ave. is the owner and builder.

Plans are being prepared for the erection of a warehouse, workshop and garage to cost $100,000 on St. Helens Ave. near Dundas W., for Loblaws Groceterias Co. Ltd.; architect, Mr. Chown, 62 Charles St. E.

C. L. & D. Williams, 337 Danforth Ave., are the owners and builders of a drug store and apartment corner Vaughan Rd. and Glenvalley; 2 storeys 25 x 55, brick construction.

Bulk tenders are being received by Toronto Transportation Commission, 35 Yonge St., till August 31 for the construction of brick office building; brick and galvanized iron frog shop; brick salt, sand and charcoal storage building. Plans and specifications with the Building Department, 35 Yonge St., Toronto, Ont.

CONTRACTS AWARDED

Cochrane, Ont.
Van Rassel Bros., are the general contractors for a $2,500 bakery being built for the Purity Bread & Cake Co.

Cornwall, Ont.
Excavating has started for extension to paper mills owned by the Howard Smith Paper Mills, Montreal, Que. P. Dore, Valleyfield, Que., is the general contractor at $225,000 and will shortly call tenders for gravel roofing; column forms—Deslauriers Metal Products Co.;—agent —H. A. Aldington, 15 Yonge St. Arcade, Toronto; brickwork—B. Deschnes, Valleyfield, Que.

Corbyville, Ont.
The contract for 2 rack warehouses has been awarded to A. F. Byers & Co. Ltd., 340 University St., Montreal, at $150,000, and they want prices on 600,000 ft. red pine lumber.

Ford, Ont.
Canadian Steel Co., Walkerville, Ont. received the contract for reinforced steel in connection with by-products building for Ford Motor Car Co. of Canada.

Hamilton, Ont.
Messrs. McKay Bros., St.Eloi apartments, are the general contractors for stores and apartments to cost $35,000 being erected on Ottawa St.; 2 storeys and basement, 40x 90.

Kitchener, Ont.
The following sub-trades have been let in connection with $440,000 hospital being erected on Queen St. Crescent: excavating—Lioni & Co., Toronto; tile and terrazzo—Italian Mosaic & Marble Co., Toronto; casement sash—Architectural Bronze & Iron Co., Toronto; plastering—Hill Bros., Hamilton, Ont.

Ruppel Co. have the heating and plumbing contract for $7,000 store being erected on College St.

Leamington, Ont.
Angus C. Fox is doing the electrical work on $14,000 store block for A. Jos. Wahby.

Moncton, N. B.
F. Bray is the general contractor for repairs and addition to building owned by the Moncton Tramways, Electric & Gas Co. No materials purchased.

Montreal, Que.
The following sub-trades have been let on $60,000 labor temple being erected; masonry work—C. Frennette, carpentry work— Jos. Boyer; roofing—Mr. Lavoie, Cadieux St.; electric—L. Dansereau; plumbing and heating— L. H. Hogue; plastering— A. Desjardins.

The following sub-trades have been let in connection with residences, garages &c. and central heating plant being erected for the Residential Development Limited; metal window stripping—Window Strip & Supply Co. Ltd.; plumbing fixtures—Crane Co. Ltd.; brickwork—David McGill; boilers—Port Arthur Engineering & Shipbuilding Co.; heating (coal and oil)—International Combustion Co. Foundation Co., Ltd., general contractors, are receiving tenders on finished hardware.

The steel work is now going up in connection with repairs to bank to cost $30,000 on st. James St. The following contracts have been awarded: steel—Dominion Bridge Co. Ltd.; roofing—Metal Shingle & Siding Co.; plumbing and heating—Ogilvy Bros. plastering—McNutt Bros.; painting—Frayer & Mathewson. Balance of sub-trades to be let.

The Turnbull Elevator Company have received the contract for elevator to be installed in $100,000 warehouse being erected on Craig St. Plumbing and heating is being done by Art Lemoux, care of owner, A. Prudhomme & Fils Ltd.

The foundations are in for a $60,000 apartment house at 169-179 Stanley St. Messrs. F. Tremblay & Co. have received the contract for millwork.

Pouring concrete at fourth floor is now being done for departmental store on St. Catherine St.; plumbing and heating is being put in by Garth & Co.; elevator —Otis-Fensom Elevator Co. Ltd.

The following sub-trades have been let in connection with $25,000 store and flats being erected on Demontigny St.; masonry— C. Frennette; carpentry— Jos. Boyer; roofing—Mr. Lavoie, Cadeaux st.; electric—L Dansereau; plumbing and heating—A. Desjardins.

New Hamburg, Ont.
The excavation has started for $7,000 business block being built, 2 storeys, 50 x 100. The following sub-trades have been let: electric, Geo. Morley; plumbing and heating—Geo. Steines; plastering and masonry—J. Ruehl; painting—J. Fisher.

Ottawa, Ont.
Alex. christie & Sons, are the general contractors for $60,000 stores and offices to be built corner Bank and Laurier Sts.

Peterboro, Ont.
T. C. Ephgrave is the general contractor for addition to factory on Park St. for the DeLaval Co., Ltd.

Portage La Prairie, Man.
Work has commenced on $40,000 oatmeal mill being built for Metcalfe Milling Co. Gibb & McCaig are the general contractors.

St. Fabien, Que.
Work is now in progress on $10,000 saw mill and factory being erected. Auguste Boucher is the general contractor; masonry work—Xaxier Jean; sheet metal and roofing— J. C. Gauvin; mill work—Bernier & Freres.

St. Catharines, Ont.
The following sub-trades have been let in connection with stores and flats being erected at 223 St. Paul St., electrical work, H. C. Holmes; plastering— Greenlaw & Cutterbuck; sheet metal and

[illegible] plumbing—C. Chapman.

Swift Current, Sask.

A. E. Hamilton, Moose Jaw, Sask., is the general contractor for repairs to Canadian Pacific Rly. engine house to cost $10,000.

Toronto, Ont.

The contract for building ice house and drying shed etc. on Willowdale Ave., for the Lake Simcoe Ice Co., has been awarded to R. G. Kirby, general contractor, 539 Yonge St.

Messrs. W. E. Dillion & Co., 189 George St., has received the roofing contract in connection with alterations and addition being made to factory at 19-23 [illegible] St., for Ault & Wiborg Co. of Canada.

The following sub-trades have been let on 2 stores and apartments being built on Dundas West: heating—Toronto Furnace Co. Ltd.. plastering—M. Lipsky & Co.; electric—J. Rotstien.

The following sub-trades have been let in connection with additions and alterations to 2 residences for stores, at 10-12 Bloor East: heating—Max Esmig; electric— J. A. Craig; roofing and sheet metal— H. Wolfe & Son.

M. A. Farrelly, 600 Coxwell Axe., has the contract for plastering work on alterations to theatre at 25 Adelaide W.

R. G.Kirby, 539 Yonge St., is doing the carpentry work in connection with 2 stores and apartments being built at 4 Bloor West.

Teagle & Son, 310 Davenport Road are the general contractors for $10,000 store and apartments being built at 4 Bloor West, owned by Dominion Realty Co.

Verdun, Que.

M. Stannard is owner of residence and 2 stores to cost $12,000 being erected on Wellington St. H. Lafrance is the general contractor.

Residences

Halifax, N. S.

D. F. Saxton, architect, 17 Birmingham St., is preparing plans of a residence for Mrs. Catherine M. Power on Young Ave. Tenders will be called when plans are complete.

Plans for 4 flats on Wellington St. for Wm. Moriarty, are being prepared by D. F. Saxton, architect. When plans are complete, tenders will be called.

Hamilton, Ont.

J. H. Honeyford, 16 Kensington north, is the owner and general contractor of 2 residences, $10,000, being built on Main St., east; 2 stories, brick construction.

T. Levington, Hilda Ave., is owner and general contractor of 2 residences being built on Wexford Ave. to cost $6,000 and will let sub-trades; 1 storey, brick construction.

Plans have been drawn for a $14,000 residence corner Cumberland and Fairleigh Crescent. W. D. Armstrong, Spectator Building, is the owner and general contractor.

Work has started on $4,000 residence being erected on Ottawa St., south; 2 storey, brick construction. W. Hughes, 141 Wentworth north, is the owner and general contractor.

H. Taylor, 101 Jackson St., W., is having plans prepared for 2 residences to cost $8,000; 1 storey, 24 x 36, frame construction.

London, Ont.

T. Evans, 27 Yale St., contemplates erecting an $8,000 residence here.

Milton, Ont.

S. Henson is the owner and general contractor for 4 residences being built on Court St.

Montreal, Que.

The building of residences and garages to cost $30,000, on Notre Dame de Grace, is contemplated by J. R. Lefebvre, 246 St. Antoine St., the owner. General contractor will probably be J. B. Lefebvre, 344 Addington St

The framework is now up for $25,000 residence being erected on 2nd Ave., between Rosemount Boulevard and Holt. Sub-trades will be let by the owner, E. Meloche, 305 7th Ave.

A. Leclair, 120 Leclaire St., is owner and builder of 3 residences, $24,000, on Ville-Marie, between St. Catherine and Adam Sts.; 3 stories, 28 x 45, frame and brick construction. Masonry, roofing, electric, plumbing and plastering to be let.

J. Mennard, 162 Davidson St., is the owner and builder of two residences, $15,000, being erected on St. Germain; 3 stories, 50 x 50, brick construction.

J. Hyland, 1209 Messier St., is owner and builder of 2 residences to cost $15,000 on Delorimier St.; 3 stories, 25 x 30, frame and brick construction.

Montreal West, Que.

Tenders are wanted on cut stone, marble, millwork, tiling, roofing, painting, plumbing, heating, plastering and electrical work in connection with $10,000 residence being erected on Ballantyne Ave. Address tenders to Mr. Grey, Jr., 974 Tupper St.

Montreal, Que.

Foundations are going in for an $8,000 residence on Lafontaine, between Bennett and Wm. David Sts. C. A. Bergeron, 2515 Ste. Catherine St., E., is the owner and builder.

H. Provost, 67 Park Lafontaine, is owner and builder of 2 residences, $10,000, at 21 St. Zoe St.; 3 stories, 43 x 53, brick construction.

Outremont, Que.

L. J. Filion, 2052 Hutchison St., is owner of a residence to be erected on Dunlop Ave. and wants prices on all materials. Tenders wanted on masonry, carpentry work, roofing, electric, plumbing, plastering and painting trades.

Point Grey, B. C.

A. A. Riley is owner and builder of $5,000 residence at 3575—36th Ave. W.; 1½ stories, 24 x 36, frame construction.

V. C. Street, is owner and builder of $4,500 residence at 4989 Trafalgar St.; 2 stories, 26 x 42, frame construction.

A. L. Ramage is owner and builder of $5,000 residence at 6609 Sparling St.; 1½ stories, 25 x 37, frame construction.

Port Arthur, Ont.

Shuniah Development Co. are the owners and builders of 9 residences on McKibbon St. to cost $30,000 on McKibbon St.; 1 and 1½ stories, frame construction.

Sandwich, Ont.

Wm. R. Pierce, Sandwich, Ont., is the owner and general contractor for $5,500 residence being built on Randolph St.

Toronto, Ont.

W. F. McCutcheon, 34 Northcliffe Blvd., is owner and builder of 1 pair residences, $7,500, west side Shaw St. near College. 2 stories, shingle and brick construction.

Gingrass Bros., 6 Cowan Ave., are the owners and builders of 1 pair residences $8,000, west side Indian Rd. near Abbott Ave.; 2 stories, brick construction.

A. Reid, 27 Coxwell Ave. is owner and builder of 1 pair residences, $8,000 being erected at 2-4 Lawlor Ave.; 2 stories, 28 x 36, frame and brick construction.

Webb & Costage, 32 Redwood Ave. are the owners and builders of 1 pair residences, $4,500 each, east side Highfield Rd. near Gerrard St. E.; 2 stories, 32 x 36, shingle and brick construction.

H. E. Warrington, 222 Woodbine Ave. is the owner and builder of 1 pair residences, $8,000, west side Rhodes Ave.; 2 stories, 26 x 34, frame and brick construction.

J. Garland, 1181 Woodbine Ave. is the owner and builder of 1 pair residences, $8,000, at 48-50 Meagher Ave.; 2 stories, 32 x 38, frame and brick construction.

King Bros., 6 Neville Park Blvd., are the owners and builders of 1 pair residences, $6,000 each, north side Rhyl Ave. near Haslett; 2 stories, frame and brick construction.

Work will start shortly on 1 pair residences, $8,000, east side East Lynne Ave. 2 stories, 28 x 34, frame and brick construction. Arthur & Arthur, 11 Thyra Ave., are the owners and builders.

Grimshaw Bros. are owners and builders of 6 pair residences, $6,000 a pair, north side Balliol St.; 2 stories, 32 x 34.

The walls are going up for a $9,000 residence at 305 Rose Park Drive being built by the Select Home Corporation; 2 stories, brick construction.

Willis Bros. & Knowles are the owners and builders of 2 pair residences, $6,000 a pair, at 60-66 Foreman Ave.; 2 stories, 32 x 36, shingle and brick construction.

Tenders on plastering. heating, electric and plumbing trades are being received by M. Sack, 827 Dundas W., in connection with 3 residences being built on Millwood Road.

Tenders being received by the owner, Mr. Venzhioretti, 7 Springrove Ave,. on plastering, heating, plumbing, electric, and painting, in connection with 3 residences being built on west side Greenwood, near Gerrard.

Excavation has started for 1 pair residences to cost $7,000, east side Ronan Ave.; 2 stories, 32 x 36, brick construction. Stephen N. Styles, 19 Normanna Ave. is owner and builder.

Ireland Bros., 35 Sheldrake Blvd., are the owners and builders of an $8,000 residence on Dinnick Crescent; 2 stories, brick construction.

T. Berrie, 82 Lyall Ave., is the owner and builder of 3 pair residences $7,500 each, being erected on north side Wrenson Road, near Pullen Ave.. 2 stories, frame and brick construction.

J. Bentley, 517 Runnymede Road, is

the owner and builder of $7,500 residence on east side Brummell Ave.; 2 stories, 22 x 34, brick construction.

J. & L. Essex, 218 Caledonia Ave., are the owners and builders of 2 residences west side Gilbert Ave., $3,500 each; 1 storey, frame and brick construction.

Art. Hindle, 98 Strathcona Ave., is the owner and builder of 1 pair residences, $8,000, on north side Wrenson Road; 2 stories, frame and brick construction.

The walls are now going up for $6,000 residence west side Woodbine Ave., near Kingston Road. Owners and builders—W. N. McEachren & Sons Ltd.

Work is to start shortly on a pair of residences, $8,000, south side Fouth Ave.; 2 stories, 40 x 36, frame and brick construction. Owner and builder—Art. Slightham, 125 Wolverleigh Blvd.

Gaylord & Wood, 70 Eaton Ave., are the owners and builders of 1 pair residences, $7,500, on west side Cannon Ave., near Gerrard east; 2 stories, frame and brick construction.

Excavating has started for a $7,000 residence, east side Pinewood Ave., near Valley Road; 2 stories, 24 x 36, brick construction. Owner and builder—L. J. Bland, 18 Vermont Ave.

S. Gray, 191 Caledonia Ave. is the owner and builder of 2 bungalows, $4,000 each, on west side Caledonia Ave.; 1 storey, brick construction.

Excavating has started on duplex residence being erected at 99 Hacken Ave.; 2 stories, brick construction. Owner and builder is Wm. B. Charlton, 12 Kendal Ave., and employs a regular staff and buys material as required.

Plans are being drawn for residence to be erected on Mulberry Ave.; 2 stories, 36 x 23, brick construction. Owner and builder—Steven Avis, 1309 St. Clair Ave. W.; architect—D. H. Burnham, 260 Lauder Ave

Geo. Taylor, 183 Hiawatha Road, is the owner and builder of 1 pair residences, $7,500, on east side Hiawatha Road, near Walpole Ave.; 2 stories, frame and brick construction.

Work is to start shortly on 2 residences to be erected east side Bingham Ave., below Kingston Road. 2 stories, frame and brick construction; owner and builder, Chas. Massie, 14 Cornell Ave.

C. A. Scott, 22 Stanhope Ave. is owner and builder of 2 residences to cost $4,500 each, east side Stanhope near Don Mills Road; 2 stories, frame and brick construction.

The walls are now going up for 2 bungalows, $7,000, being erected on west side Connor, near Sammon Ave.; 1 storey, brick construction. Cubero & Brown, 3 Strathcona Ave., owners and builders.

Walls are going up for 1 pair residences, $5,500 each, near side Brookdale Ave. near Greer Road; 2 stories, brick construction. Wellon & Pilley, 97 Day Ave., are the owners and builders.

Messrs. Churchill & Morrell, 699 Woodbine Ave., are the owners and builders of 4 residences, $5,000 each, to be erected on Milverton Blvd., near Coxwell Ave.; 2 stories, brick construction.

Tenders are being received by the Ontario Real Estate Co., 766 Dundas W., for hot water heating, electric and plumbing work for five residences on Spadina Road.

D. M. George, 136 Wallace Ave., is owner and builder of 2 residences south side Park Road, near Windermere; 2 stories, brick construction.

Jos. Mullen, 139 Barton Ave., is owner and builder of 1 pair residences on Barton Ave.; 2 stories, shingle and brick construction.

Truro, N. S.

Tenders being received by architect, E. D. Veron, till August 27, for erection of a $9,000 rectory. Separate tenders for plumbing and heating. Plans and specifications with architect.

Vercheres, Que.

P. L. Q. Dupre, 20 St. James St., is preparing plans for an $8,000 cottage for M. Laporte.

Waterloo, Ont.

P. Cragnoline is builder of an $8,000 residence on Victoria St. for P. J. Hoffman.

Winnipeg, Man.

C. T. Lount is the owner and builder of a $9,000 residence on Cordova St.; 2 stories, 30 x 34, hollow tile and stucco construction.

Windsor, Ont.

Plans are being prepared for erection of a $12,000 residence. The owner is H. Hefferman, Randolph St., Sandwich, Ont. Architect—H. Hallett, 15 Victoria Block.

Westmount, Que.

Chas. J. Brown & Son are the owners and builders of 4 semi-detached residences on Thornhill Ave., and are in the market for materials.

Windsor, Ont.

Excavating has started for a $7,000 duplex residence being built on Dougall Ave.; 2 stories, 24 x 44, brick veneer construction. Robt. Wilson, 1538 Dougall Ave. is the owner and builder.

CONTRACTS AWARDED

Bonnington Falls, B. C.

McDougall & McCharles, Nelson, B. C., are the general contractors for 2 residences being erected at a cost of $6,000.

Cardston, Alta.

J. L. Larson is doing the interior trim work on $5,000 residence being built for John Peterson, Cardston, Alta.

Cowansville, Que.

Wallace & Green, Milton, Que. are the general contractors for 20 residences being erected for the Cowansville Realty Co., to cost $2,800 each. 1½ stories, 30 x 35, frame and brick construction.

Fredericton, N. B.

The foundation is in for $6,000 residence being erected on Gray St. for O. C. Hicks. Moses Mitchell, 116 Brunswick Ave., is the general contractor and is also doing the carpentry work. Masonry work is being done by Wm. Ross, Queen St.

Gull Lake, Sask.

Work has commenced on $6,800 residence being built by Fred Selvig, Shaunavon, Sask. C. E. Willson, Shaunavon, Sask., has contract for heating.

Hamilton, Ont.

D. T. Cooper, 164 Avondale Ave., is the general contractor for alterations to apartments corner James and Colborne Streets.

Halifax, N. S.

D. S. Dunlop has the contract for building residence for Dr. H. K. MacDonald, on the Cobourg Road, estimated to cost $21,000.

Kitchener, Ont.

O. Knechtel, Waterloo, Ont., has the heating and plumbing contract for $4,500 residence being erected for J. Simmons.

P. Gragnoline is the general contractor for $7,000 residence being built for J. Waldschmidt, Weber St.

Long Branch Park, Ont.

Mr. Todd, stop 25, Lake Shore Road, is the general contractor for residence being erected and following sub-trades have been let: carpentry—P. Murphy; electric and painting—J. McNeiod; heating, Horton & Pearce; plastering—P. Murphy.

Lachine, Que.

Jos. Theoret is the general contractor for 4 double cottages, $9,300 each being erected corner 36th and Broadway for Cardinal & Beauchamp, owners. 2 stories, 30 x 40, frame and brick construction.

Moncton, N. B.

Trueman Steeves, Gordon St., has been awarded the contract for repairs to residence at 128 Weldon St., owned by M. J. Purdy. No materials purchased.

Montreal, Que.

The following sub-trades have been let in connection with $65,000 residence on Decarie Blvd.: masonry work—E. Corbeil; roofing, plumbing and heating—O. Caron; electric—J. A. St. Amour; tiling F. Lepage; plastering and painting to be let.

J. H. Salisbury, Walkley Ave., is the general contractor for $8,000 residence (2 flats) being erected on Walkley Ave. for R. Tudge, 132a Belgrave Ave. 2 stories, 30 x 40, frame and brick construction.

T. Bellehumeurr, 1231 Parthenais, is the general contractor for an $8,000 residence being erected on Masson between 2nd and 3rd Aves. for R. Morin, 937 St. Denis St.; 3 stories, 22 x 50, frame and brick construction.

The roofing of residence at 545 Deserables St. is being done by the Metal Shingle & Siding Co.

The walls are now going up for 3 flats being erected on St. Denis St. and the following sub-trades have been let: masonry work—Bourck & Jerron; roofing—Daniel Kochenburger; electrical work— Omer Langevin; plastering—J. Laplante, care owner, A. Marquette, 3762 St. Denis St.

M. Lapierre, 650 Fabre St., has the contract for plastering in connection with residence being built on Deserables between Sherbrooke and Gauthier.

The following sub-trades have been

(Continued on page 57)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders Wanted

[illegible] concrete bridge in Nassa[illegible] [illegible] Sec. 26 ft span clear, width [illegible]

[illegible] specifications to be seen at the [illegible] J. Marshall, Clerk, or at the home of [illegible] Reeve

Tenders to be closed on Sept. 1st., 1923.

The lowest or any tender not necessarily ac[illegible]

JOHN MARSHALL, Clerk,
Campbellville P.O., Ont.

[illegible]

Village of Port Dover

Sealed tenders for a Tarvia Macadam Pavement, and Curbing and Gutter, approximately 14,000 yards pavement and 2,000 lineal feet curbing and gutter, addressed to James Sloan, Clerk of the Village of Port Dover, will be received until 5 p.m.

Monday, August 27th, 1923,

Plans and specifications may be seen at the office of the Engineer, Guy R. Marston, Courthouse, Simcoe, Ont.

Lowest or any tender not necessarily accepted.

JAMES SLOAN, Clerk,
Port Dover, Ont.

August 14, 1923. 33-34

The Toronto Transportation Commission

TENDERS

Sealed tenders will be received for the construction of four Subsidiary Buildings in connection with the General Repair Shops, Bathurst St. and Davenport Road, Toronto, consisting of:

(a) A brick Office Building; (b) A brick Garage; (c) A brick and galvanized iron Frog Shop; (d) A brick Salt, Sand and Charcoal Storage Building.

Tenderers shall quote a lump sum price for the construction of all four buildings, and all tenders shall include all of the work contemplated, including all masonry, concrete work, structural steel work, plumbing, heating, electric wiring, rolling steel doors, and all other work necessary for the completion of the buildings.

All tenders are to be endorsed "Tender for Subsidiary Buildings, General Repair Shops," and are to be addressed to the Chairman of the Toronto Transportation Commission, and are to be delivered to the offices of the Commission, 35 Yonge Street, not later than 12 noon on

Friday, August 31st, 1923,

All tenders must be on the Commission's form of tender and must be accompanied by an accepted bank cheque payable to the Toronto Transportation Commission for 2½% of the amount of the tender.

Plans, specifications, form of tender and instructions to bidders may be obtained on application to the Commission's Buildings Department, third floor, 35 Yonge St., on and after noon, Friday, August 17th, 1923.

The lowest or any tender not necessarily accepted.

H. H. COUZENS, General Manager,
34 The Transportation Commission.

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

City of St. Lambert

Tenders for Laying Concrete Intake Pipe

Sealed tenders addressed to the Secretary-Treasurer, will be received at the City Hall up to 5 P.M. (Daylight Saving) on

Monday, August 27th, 1923,

as follows:

"For laying 1930 feet of thirty inch Concrete Pipe from the Water Works to a point in St. Lawrence River opposite the fourth pier of Victoria Bridge."

Plans can be seen, specifications and form of tender supplied on application.

The City reserves the right to reject any or all tenders.

I. KELLETT,
34 City Engineer.

TENDER
For Concrete Pavement

COUNTY OF ESSEX

Sealed tenders will be received by the undersigned up till noon on

Monday August 27th, 1923,

for the construction of about 1½ miles of concrete pavement, 18 feet wide and reinforced.

This pavement starts at the Town of Tecumseh on the G.T.R. and extends easterly to Pike Creek.

Plans and specifications and form of tender may be seen at the office of J. J. Newman, C.E., Windsor, Ont., or the office of W. H. Knister, County Road Supt., Sandwich, Ont.

Tenders must be accompanied by a marked cheque for $1000.00 payable to the Treasurer of the County of Essex.

The lowest or any tender not necessarily accepted.

JOHN F. MILLEN,
Sec. Windsor Suburban Area.
Sandwich, Ont. August 13th, 1923. 33-34

Tenders for Sewers

Tenders will be received by the undersigned until noon, Standard Time,

Tuesday, September 4th, 1923,

for the construction of—

1787 feet of 27-inch to 42-inch sewer.
1028 feet of 12-inch to 21-inch sewer.
11 Manholes.

Profiles can be seen, and plans, specifications and forms of tender obtained on application to the undersigned.

Lowest or any tender not necessarily accepted.

W. C. MILLER,
34 35 City Engineer.

Queen Victoria Niagara Falls Park

Tenders for Excavation

Sealed tenders, plainly marked, will be received by the undersigned up to 12 o'clock, noon

Friday, August 24th, 1923,

for approximately 17,000 cubic yards of Excavation and the embankment at Queenston, Township of Stamford.

Plans and specifications may be seen and forms of tender obtained at the office of the Park Commissioners, Niagara Falls, Ont. Marked cheque for 5% of contract price must accompany each tender. The lowest or any tender not necessarily accepted.

(Sgd.)
JOHN H. JACKSON,
Superintendent,
Queen Victoria Niagara
Falls Park, Ont.
Niagara Falls, August 10th. 33-34

FOR SALE

1—6 cu. ft. capacity Wettlaufer Mixer, on trucks with Fairbanks-Morse Gasoline Engine and power side loader $200.00

1—10 cu. ft. capacity Wettlaufer Mixer, on trucks with 5 H.P. Gasoline engine and power side loader $400.00

Above machines have been thoroughly overhauled, repainted and are in good operating condition.

K. W. LEWIS
105 Front St. E.,
33-34 Toronto, Ont.

Manager wanted to take charge of gravel business at bed. Good opportunity for man who has a small capital to invest in the business. Apply Box 101, Chatham, Ont. .33-34

CITY OF TORONTO

Tenders for
A Three-Motor Electric Travelling Crane, Hoist and Appurtenances

Tenders will be received by registered post only, addressed to the Chairman, Board of Control, City Hall, Toronto, up to 12 o'clock noon, **September 4th, 1923**, for the following:

TENDER NO. 53 ONE ONLY THREE-MOTOR ELECTRIC TRAVELLING CRANE, HOIST AND APPURTENANCES.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and Form of Tender may be obtained at the Works Department, Room 12, City Hall, Toronto. Tenders must comply strictly with conditions of City By-law as to deposits and sureties as set out in Specifications and Form of Tender.

The lowest or any tender not necessarily accepted.

C. ALFRED MAGUIRE, (Mayor),
Chairman, Board of Control.
Aogust 4th, 1923. 34

For Sale

1—Sawyer Massey Road Grader.
1—50 ton bin and screen, with elevator and buckets.
1—London paver.
Box 291, Contract Record, Toronto. 30 t.f.

STEEL PILING

Bought and Sold

Universal Equipment Company

28-t.f. Niagara Falls

FOR SALE

3 Drum Lidgerwood Hoist 65' Boom. 8" x 8" Compressor and Motor on Trucks. 12 x 16 Crusher. 6 cu. ft. Gasoline Mixer. Also other equipment. J. G. Sipprell, Box 495, Halifax, N.S. 33-36

Some One Wants to Buy

The equipment or machinery that you are not using.

It may be occupying valuable space in your yard or shop, collecting dust, rust and hard knocks.

Sell it before "Depreciation" scraps it.

Use the **Tender & Proposals Department.** It helps others, let it help you.

Construction accountant seeks position—ten years experience construction and industrial work. Available immediately. Box 361, Contract Record, Toronto. 34-37

Position wanted—Civil Engineer, presently employed, seven years experience in highway, pavement and railway construction, surveys and engineering office practice, neat draftsman. Position desired with industrial corporation, contractor or municipal engineering firm. Apply Box 358, Contract Record, Toronto. 34-35

Civil Engineer and Contractors' Superintendent, with experience in concrete construction, water and sewerage systems, office and factory building construction and Housing Development schemes, desires position as resident engineer, contractors' superintendent or construction manager for industrial concern. Best references. Will go anywhere. Box 361, Contract Record, Toronto. 34

Town of Walkerton

Tenders for Waterworks Extension

Sealed tenders will be received by the undersigned up to six o'clock P. M., **Wednesday, September 5th,** for the following:

One steel stand pipe, two hundred thousand gallons capacity, two gasoline engines and pump one thousand gallons per minute, three small motor driven pumps automatic, an eight inch cast iron pipe and fittings.

Plans and specifications may be seen, and further information obtained from the undersigned, on or after the 27th of August. Accepted cheque for 5% of amount of tender to accompany same.

The lowest or any tender not necessarily accepted.

FRED B. JAMES, A. M. E. I. C.,
Town Engineer,
34 Walkerton, Ont.

Residences

(Continued from page 55)

let on $8,000 residence being built on Dante St.: masonry work—N. Boivin; roofing and plumbing—A. Belair; plastering—Mr. Joisy, 2860 Desbelges.

The foundations are now going in for $9,000 residence on Desjardins, between Adam and Ste. Catherine E. A. Allard, 2930 Adam St., is the general contractor.

The following sub-trades have been let for $6,000 residence being erected on St. Andre: masonry work—J. A. Masson; electric—N. Lallier; plumbing—J. Presseau.

A. Lapointe, 74 Montee St. Laurent, is the general contractor of $8,000 residence being built near 2198 Boulevard Gouin West, 2 stories, 25 x 35, brick construction.

The walls are now going up for $5,000 residence on St. Dominique St. The following sub-trades have been let: masonry work—W. Senecal; electrical work—G. Meloche; painting—A. Parent. Plastering to be let.

The following sub-trades have been let in connection with $8,000 residence being built on Garnier St.: roofing and plumbing—E. Lefrancois; electrical work—J. A. St. Armour; plastering—Cusson & Lapierre; painting—Mr. Corbeil, care general contractor, A. Belanger, 555 Fabre St.

The walls are going up for 3 residences costing $18,000 being built on 11th Ave. Following trades have been let: masonry work—L. Gauthier; roofing—Metal Shingle & Siding Co.; electrical work—Romeo & Noel, care general contractor, M. Leblanc, 1239 Parthenais.

The general contractor for 3 residences and garages to cost $32,000 on Madison Square, is J. B. Lefebvre, 344 Addington: plastering—Mr. Lavoie, care general contractor; tiling—E. LePage, 990 Parthenais; painting by day labor.

The following sub-trades have been let on $9,000 residence being erected on Earnscliffe Ave.: brickwork—A. Remy; roofing—S. Martineau; electrical work—S. Quesnel; plumbing and heating—O. Mongrain; plastering—A. Brisebois.

The brickwork is going up for $12,000 residence being built on Girouard St. The following sub-trades have been let: brickwork—Mr. Prudhomme, 126 G. E. Cartier Square; roofing—S. Martineau; electrical work—W. Cousineau; plumbing and heating—Ferrier & Freres; plastering—C. Leonard.

The following have contracts on $9,000 residence being erected on Dante St., for A. Duquette, owner and builder: brickwork—Beausejour & Beauchamp, care owner; roofing—A. Belair; electrical work—R. Gingras. plumbing—Mr. Desjardins; plastering—Mr. Loiseau, care of owner.

Plastering is to start at once on $7,000 residence being built by Geo. Gariepy. The following have contracts on this building: brickwork—Z Prudhomme & Fils; roofing—J. E. Mayer; plastering—Mr. Mayotte, Lajeunesse St.; painting—Mr. Samson, care owner.

The following sub-trades have been let on 2 residences erected on Berri St.: masonry work—Mr. Verville, Berri St.; roofing and plumbing—H. Corbeil; plastering—N. Lapierre.

The following sub-trades have been let on $13,500 residence being built on Casgrain St.: brickwork—Lalancette & Falardeau; roofing and plumbing—J. H. Denus & Fils; plastering—B. Despatie, care owner, J. Beaudin, 1622 Jeanne Mance.

Tenders are wanted on plastering for $15,000 residence being built on Melrose Ave. General contractor—W. Malo, 17 Addington; sash and doors—Mr. Riopel, Sorel; roofing, J. E. Mayer, 516 Lafontaine Park; plumbing and heating—H. A. Egan & Son, 115 Colonial.

The brickwork is going up on 2 residences being erected on Boyner St., 3 stories, 33 x 43, brick construction; owner and builder, J. Deslongchamps; roofing—G. Vinnette; plumbing—Daniel Kochenburger; plastering, Mr. Legault, care owner.

The foundations are in for a $20,000 residence being built on Pine Ave.; 3 stories, 20 x 47, brick construction; owner—G. I. Drummond, 314 Notre Dame W.; general contractors—J. MacGregor, Limited.

Norwood, Man.

F. Wyndels is the general contractor for 3 residences, $2,100 each, being erected on west side Hill St. for W. J. De La Gilais, 322 Main St., Winnipeg Man. General contractor will purchase materials and sub let trades.

Ottawa, Ont.

F. G. Rideout, 5 Gordon St., is the general contractor for residences to be erected on Iona St.; 2½ stores, 44 x 36, brick veneer construction.

J. Riel, 197 MacKay St., has received the contract for excavating and foundations of $8,500 residence to be erected on Keefer St.

The following sub-trades have been let in connection with $7,000 residence being built on Sunset Boulevard: plumbing—A. W. Allen; plastering—H. W. Davis; electric—J. A. Ellacott; heating—Murphy & Morrow.

Outremont, Que.

The following trades have been let for cottage being erected on Maplewood Ave.; masonry work—Jos. Brodeur;

[illegible], [illegible] and plumbing—D. [illegible]; electrical work—Canada Duplex [illegible]; plastering—Mr. Lam[illegible] [illegible].

The following sub-trades have been [illegible] on [illegible] residence being built on [illegible] Ave.: millwork—J. H. Lebeau; roofing—Geo. W. Reed & Co.; electric—Canadian Duplexable Co., Ltd.; plumbing and heating—Conroy Bros.; plastering—Laviolette & Fortin; painting and [illegible]—[illegible] Painting & Decorating [illegible].

The following sub-trades have been let on $15,000 residence being erected on [illegible] Ave.: masonry work—M. [illegible]; millwork—Z. Berthaume; [illegible], [illegible] and heating—G. Fontaine.

The following sub-trades have been let on $14,000 cottage being built on Outremont near St. Catherine Road: [illegible]—E. [illegible]; millwork—Z. [illegible]; roofing, plumbing and heating—Belisle & Freres.

The foundations are in for a $24,000 cottage being built on Holyroad. The following sub-trades have been let: masonry, carpentry and roofing—Reid Bros.; electrical work—Hayes & LeBre[illegible]; plumbing and heating—Reid Cambridge; painting—Thos. Lefter.

Point Grey, B. C.

D. Murray, 4663—10th Ave. W., Vancouver, B. C., is the architect and general contractor of $6,000 residence being erected for Mrs. Agnes E. Kyle; 2 stories, 27 x 35, frame construction.

Quebec, Que.

Alex. Fackney is the general contractor for a $12,000 residence being built for R. Quirouet; 2½ stories, 32 x 37, brick veneer construction.

The following sub-trades have been let in connection with $14,000 residence being erected on St. Cyrille St.: plumbing, electrical work and heating—P. O. Giguere Cie., Ltee.; painting—J. Tardi[illegible]; roofing—Jos. Pichette.

Sydney, N. S.

Work has started on $12,000 residence being erected for M. A. Doak; 2 stories, frame construction. Chappells Limited, are the general contractors.

Saskatoon, Sask.

Dolloff & Noble are the general contractors for 2 residences, $4,500 each, being built on Poplar Crescent for Wm. Hopkins; 1 storey, 24 x 36, stucco con-

St. Catharines, Ont.

The walls are now going up for a $6,000 residence at 61 Ontario St. S. The following trades have been let: sheet metal, heating and plumbing—Bowman Bros.; electrical work—H. C. Holmes; plastering—A. B. Barratt; painting—F. Wright.

The following sub-trades have been let in connection with alterations and addition to residence at 89 James Street: masonry work—George Rymer; carpentry work—W. W. Park; plastering—Greenlaw & Clutterbuck. Tenders being received by architect, Thos. H. Wiley, 128 St. Paul St., on roofing, sheet metal, painting, electric, plumbing and heating.

J. Haines, Taylor Ave., is doing the heating and plumbing work for two residences being built by W. E. Swartz, 19 Russell Ave.

A. A. Crabtree, 51 Beech St., is the general contractor for $7,000 residence being erected at 209 Ontario St., for T. W. Jones, 5 Elizabeth St. W.

Sandwich, Ont.

C. Usher, Sandwich St. E., has the contract for electrical work on $4,000 residence being built on Rankin Blvd.

Stratford, Ont.

The following sub-trades have been let on $5,000 bungalow being erected: plastering—A. McKay; painting—R. T. Shore.

F. L. Duggan has the plumbing and heating contract for $10,000 residence being built on Queen and Water Streets.

Jas. Commerford has the plumbing and heating contract for addition to residence for Nuns' Home on Well St.

St. Stanlislas, Que.

Masonry work on $8,000 residence being erected for Donat Cherest, is being done by Cossette & Gauthier, Three Rivers, Que.

Toronto, Ont.

The following sub-trades have been let on $8,000 residence, east side Lawlor Ave., near Kingston Rd: electric, Taylor Bros.; plumbing—J. Fraser; heating—Mason & Allen; plastering—J. McKenzie.

The following sub-trades have been let in connection with pair residences being built on east side 8th Ave. near Gerrard E.: electric—T. B. Kilner; plumbing—J. W. Barrett; heating—York Sheet Metal Co.; painting—A Stone, care owner, 234 Milverton Blvd.

The following trades have been let in connection with $4,500 residence at 253 Bingham Ave.: plumbing—W. E. Manners; heating—W. J. Merrill.

The following sub-trades have been let on $12,000 residence being erected on Oakmount Road near Bloor; plumbing—W. G. Minns; heating— Peerless Furnace Co.

Sub-trades on $5,000 residence being erected west side Victoria Park near Kingston Rd.. have been let as follows: electric—Mr. Garvin, care owner, 104 Edgewood Ave., plumbing—Duffort Bros.; heating—Toronto Furnace Co.

The following sub-trades have been let in connection with $5,000 detached bungalow being erected on west side Meagher Ave.: electric—Taylor Bros.; plumbing—J. Fraser; heating—Mason & Allen; plastering—J. McKenzie.

The following sub-trades have been let for pair residences to cost $7,500, north side Gerrard E., near 8th Ave.: electric—C. M. Stevens; plastering—Wright & Gaunt; painting—A. J. Rance.

The following sub-trades have been let in connection with 3 pair residences being built on south side 4th St.: electric—C. M. Stevens; heating—Howard Furnace Co.; plastering—Wright & Gaunt; painting—A. J. Rance.

The walls are now going up for a pair of residences on west side Cannon, near Gerrard E. The following sub-trades have been let: electrical work—S. Johnston; plumbing—J. Fraser; heating—A. Lightfoot; plastering—F. Drewhurst; painting—W. Rowe.

W. S. Wilson, 1 Humewood Court Apartments, is the general contractor for $12,000 residence being erected on south side St. Leonards Ave., near Dundurn Crescent, and is supervising all the work.

The foundations are going in for a $20,000 residence on the north side Lonsdale Road, near Baker St.; 2 stories, 29 x 61½, stone and brick construction. R. W. H. Binnie, 147 Westmore Ave. is the general contractor and supervises all work.

Verdun, Que.

L. Lemieux is the general contractor for $7,000 residence being built for J. M. Modler; 3 stories, 30 x 45, frame and brick construction .

Westmount, Que.

C. J. Brown Ltd., 4263 St. Catherine St. E., are the general contractors for $22,000 residence and garage being built on east side Grosvenor Ave., and are in the market for material.

Walkerville, Ont.

Foundations are going in for a $7,000 residence and garage on Kildare Road. John Catin, 330 Lincoln Road is the general contractor.

Winnipeg, Man.

Morrison Construction Co. are the general contractors for $5,000 residence being built on Luxton Ave.; brick and stucco construction.

Power Plants, Electricity and Telephones

Ford City, Ont.

Tenders on plumbing and heating of power house and screen house for Ford Motor Car Co. of Canada, Ltd., have been received.

St. John, N. B.

Tenders being received by R. C. Desrochers, secretary, Parliament Buildings, Ottawa, Ont., for an electric light transmission line. Plans and specifications at office of chief architect, Ottawa, Ont., and res. architect, Dept. of Public Works, St. John, N. B.

Verdun, Que.

Work on transformer station and transformers for electric system to cost $10,000 will be started at once.

Work will start shortly for an extention to the lighting system at a cost of $9,000.

Weston, Ont.

P. H. Secord & Sons Construction Co. Ltd., Temple Bldg., Toronto, want price on sub-trades in connection with Weston Telephone exchange to be erected.

Miscellaneous

Toronto, Ont.

Tenders are being received by C. A. Maguire, chairman Board of Control, till

THE JOHN INGLIS CO.
LIMITED
ENGINEERS AND BOILERMAKERS
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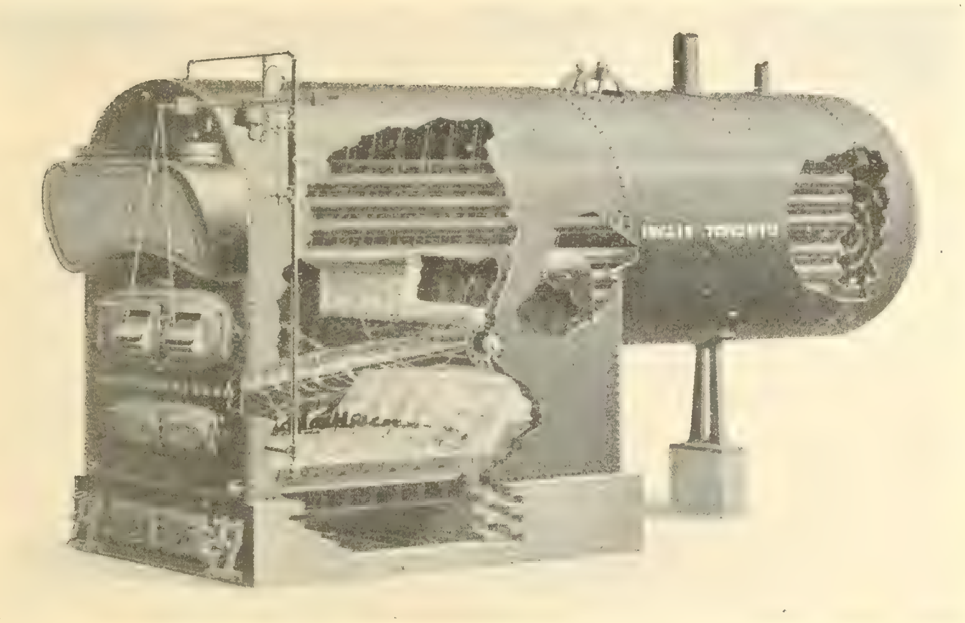

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Montreal Sales Office—385 Beaver Hall Square

[illegible] motor electric travelling crane, hoist and appurtenances. Specifications, etc., at room 12, City Hall.

Queenston, Ont.

Tenders [illegible] received till August [illegible] by John [illegible] Jackson, superintendent, [illegible] of excavation and [illegible] Queen Victoria Niagara Falls Park Commission.

Fires

Lindsay, Ont.

The Dailey Lumber company's planing mill was completely destroyed by fire recently, with a loss estimated at $16,000.

Milestone, Sask.

Fire recenty resulted in a total loss of more than $20,000, destroying the hall, J. J. Currie's furniture store and Sam Cameron's grocery store.

Romney Twp., Ont.

Fire recently destroyed the stock barns of Carl Coatsworth, Coatsworth, Ont. The loss is estimated at $15,000. Owner undecided about rebuilding.

Windsor, Ont.

Fire recently destroyed a factory building on Victoria Ave. with a loss of $90,000. Owner will not rebuild.

Montreal, Que.

Messrs. Ledoux, Jennings Ltd., suffered the loss of $300,000 when a fire recently destroyed a garage corner Mountain and Osborne Sts. The owners are undecided about rebuilding.

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FIDELITY AGENCY OF CANADA

Hamilton, Ont.

The warehouse of G. S. Dunn, 95 Main St. W., was damaged by fire recently which amounted to over $10,000.

Late News

Aberdeen Lake, B. C.

Work is to start at once on addition to dam near Vernon, B. C., at a cost of $25,000.

Bengough, Sask.

E. D. Winn, Assiniboia, Sask., has received the contract for 8½ miles of roadwork from Bengough south, at $10,000.

Dunkirk South, Sask.

E. W. Sutherland, Moose Jaw, Sask., has received contract for roadwork at $8,929.

Edmonton, Alta.

Plans are being prepared for an addition to sewerage disposal plant at a cost of $60,000.

Fairville, N. B.

Tenders are being received by the architect, Garnet W. Wilson, 50 Princess St., St. John, N. B., for the erection of a $70,000 orphanage. 2 stories and basement, 52 x 114, brick construction.

Georgetown, Ont.

The town council has awarded the Grant Construction Co., Ltd., contract for laying concrete pavements on Guelph St., estimated to cost $22,000.

Leaside, Ont.

Witchall & Son, 156 St. Helens Ave., Toronto, are the general contractors for $44,000 school to be erected, and will let sub-trades shortly.

Maidstone Twp., Ont.

Tenders being received till September 10 by A. Mosseau, clerk, R.R. No. 1.s., Woodslee, Ont., for a drain and two highway bridges. Plans and specifications at offices of township clerk and Laird & Laird, Essex, Ont.

Montreal, Que.

The following contracts have been awarded in connection with flats being erected on St. Denis St., near Beaubien: excavating—G. Guilbault; foundations—(probably) A. Lamothe; structural steel—MacKinnon Steel Co., Ltd. Balance of sub-trades not let.

New Waterford, N. S.

The following sub-trades have been let on $70,000 hospital being built on Plummer Ave: plastering—H. M. Israel, Sydney, N. S.; electric—Jack Donovan, Sydney, N. S.

Raymore, Sask.

J. E. Hanson, Watrous, Sask., has been awarded contract for roadwork to cost $10,470, from Raymore to Semans, Sask.

South Westminster & Fraser River, B. C.

Work is to start at once on a dyking project to cost $35,000. A. B. Palmer Co., Ltd., Vancouver, are the general contractors. Contract includes 4½ miles of dyke, ranging from 12 to 16 feet in height with the necessary sluice gate and drainage ditches.

Sydney, N. S.

Ed. Murphy, Charlotte St., has received the contract for electrical work in connection with $45,000 nurses home being built.

Windsor Mills, Que.

The Newton Dakin Construction Co., Ltd., Sherbrooke, P. Q., are the general contractors for $100,000 factory to be erected for Kilgour Bros., of Toronto, Ont.

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In 1912, Professor W. K. Hatt, of Purdue University, during his investigation of rail steel made under the direction of the American Society for Testing Materials, tested approximately three thousand samples of rail steel bars, representing the product of every rail mill in the country. The average elastic limit of the three thousand samples was 65,000 lbs. per square inch.

In 1917, Professor Talbot, of the University of Illinois, took samples of rail steel bars from the Western Newspaper Union Building which was being wrecked at that time. Tests on these bars showed an everage elastic limit of 63,000 lbs. per square inch.

In 1921, one of America's largest inspection organizations was requested to review all of the tests that had been made on rail steel from 1912 to date. This review covered over five thousand tests and showed an average elastic limit of 64,200 lbs. per square inch.

Here, then, are three widely separated series of tests, both in time and location, which disclose a variation of only 2,000 lbs. in the average yield point. What better proof could be desired of the uniformity of strength of rail steel bars?

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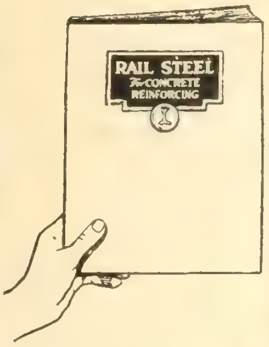

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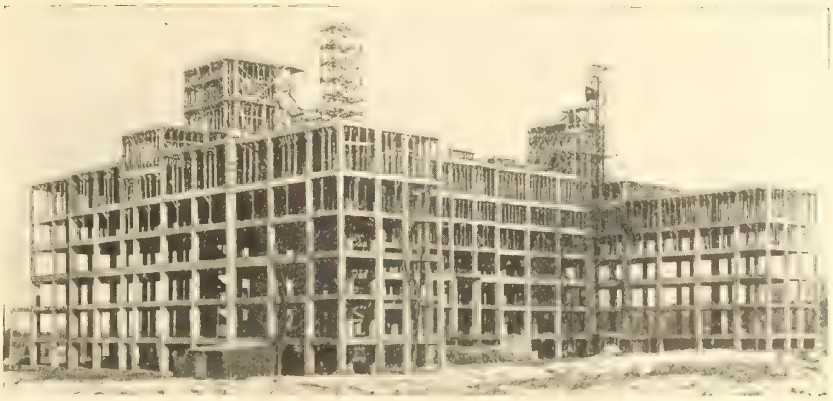
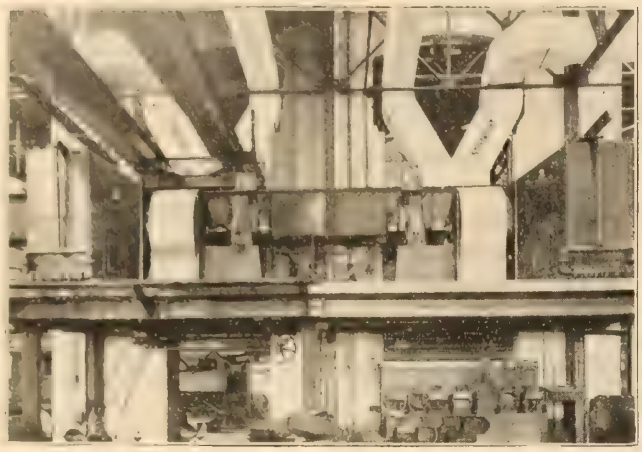


Ottawa Civic Hospital

Stevens & Lee, J. A. Ewart, Associate Architects
Harkness, Louden & Hertzberg, Engineers
Alex. I. Garvock, General Contractor.
450 tons Burlington Rail Steel Bars used.



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Safety Conditions Ignored

"Promises," as they flippantly say, "like pie crusts, are made to be broken," and compressed air precautionary regulations would seem to be in the same category. California Safety News tells of an explosion of a small air receiver under peculiarly exasperating conditions. The adapted air receiver was an old, vertical, water-range boiler, twenty inches in diameter, top head concave to pressure and bottom head convex to pressure. The pressure that would have been allowed on this tank under "Air Tank Pressure Orders" was 63 pounds. A pressure gage and a safety valve were installed on the tank. It is not known what pressure the valve was set at, and it does not appear that anyone had ever known it to blow. Air was supplied by a motor-driven compressor without automatic shut-off, and the compressor had no unloader. The motor would be started by hand, and when the pressure got up to about 110 it was stopped by hand. The compressor was designed for 75 pounds and, according to catalogue, required 7 h.p. It was necessary at times for the operator to be out of the room, and it was when he was absent that the explosion occurred. The bottom head was blown out and the tank went vertically through the roof, landing about 140 feet away. There was no discoverable defect of material. The dishing of the head was reversed; and of the 102 rivets only six were not sheared.

Temperature Inside Mines

Investigations conducted by Mr. D. Harrington in metal mines in Butte, Montana, indicate that surface air temperatures have an important bearing on underground air temperatures in shallow mines, or close to a downcast shaft or an intake air course in deep mines above the 2,000 ft. level, particularly in those mines depending on natural ventilation. In deep mines, especially in those having mechanical ventilation, day to day, or hour to hour, variations in surface temperatures have very little influence on underground air temperatures below the 2,000 ft. level except in summer, when outside temperatures are greatly in excess of 65 deg. Fah. Even in deep mines, however, a seasonal variation below the 2,000 ft. level occurs, average summer shaft temperatures being 5 deg. to 10 deg. Fah. higher than the average winter readings. Rock temperatures undoubtedly affect air temperatures underground much more than do temperatures of outside air; on the other hand, air circulating underground has a well-defined effect on rock temperatures.

Size of Sand-Blast Sand

The size of sand best adapted for the different uses of the sand blast have never been authoritatively determined, according to "Compressed Air." A prominent sand producer who caters to the foundry trade, suggests the following: Sand which passes a screen with a 0.17 inch mesh and is rejected by a 0.15 inch mesh is recommended for cleaning castings. Sand which passes a 0.15 inch mesh and is rejected by a 0.084 inch mesh is best for steel and heavy gray iron castings, and sand passing a 0.084 inch mesh and rejected by a 0.043 inch mesh is recommended for sanitary ware, stove plate, and light gray-iron castings.

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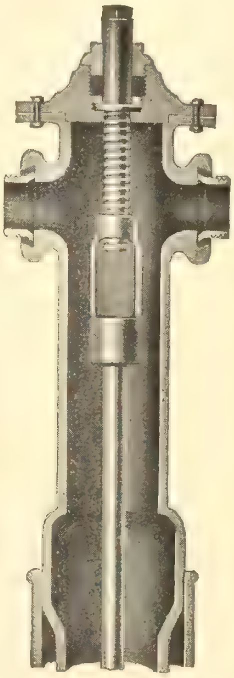

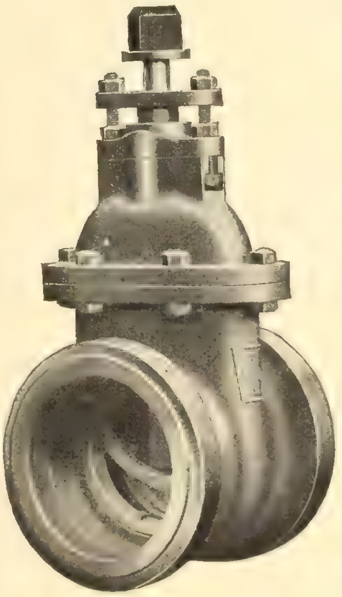

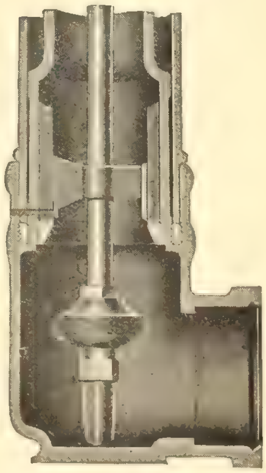

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CEMENT (Delivered on job):—					
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.45
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	10.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	25.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*†	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	25 00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125.00 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00**	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 “	“ “
Crusher run	per ton	2.20½		3.00 “	“ “
Rubble stone	per ton	2.45	1.70	15.00 cord	“ “
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	“ “
Gravel 1 in. screened	per ton	2.31	1.50	2.75 “	“ “
Sand, screened	per ton	1.42½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 “	“ “
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs	3.90 base	4.00 base	4.60	[illegible].00
Bands 3/16 in. and lighter	per 100 lbs	4.40 “	4.50 “	5.10 base	
Hoops	per 100 lbs	5.00 “	5.00 “		
Angles, channels and tees under 3 in.	per 100 lbs.	4.50 “	4.00 “	5.35	6.00
Structural shapes	per 100 lbs.	4.25 “	4.25 “	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 “	3.90 “	5.15	6.25
Plates—3/16 in.	per 100 lbs.	4.25	4.25 “	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.60	4.50 “	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.60	5.00 “	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65	7.00 “	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00	7.00 “	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 base	6.00 “	7.00 base	
Cast iron pipe	per ton	67.50 “	60.00 “		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.45	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00	.90	.65	.75
Chimney tops	each	9.00	3.50–5.00	7.50	4.50–6.00
Discounts		45 % truck lots 50 % car lots	20 % 50 %	5 %	

CEMENT:—*Discount of 10 cts. per bbl. in 20 days. Price f.o.b. cars is $3.75 †Subject to 5% discount. **Excluding bags.
LIME:—*Discount of 5%. †Bag of 50 lbs. **Price f.o.b. cars is $11.80.
BRICK AND TILE—*f.o.b. plant.
STONE SAND AND GRAVEL:—*Winnipeg prices subject to 5% discount. **Toronto prices include sales tax.

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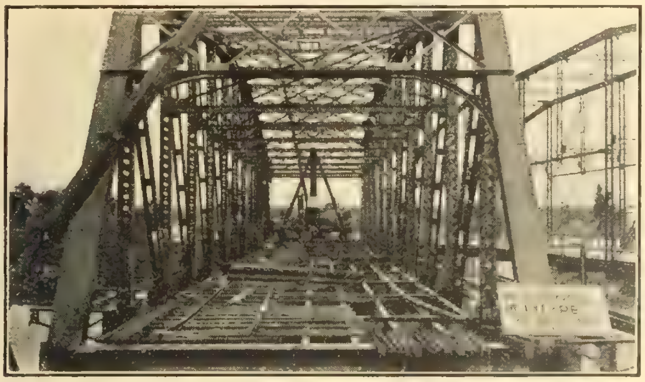

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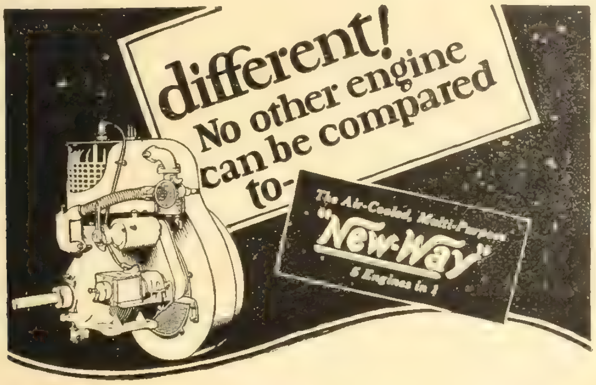

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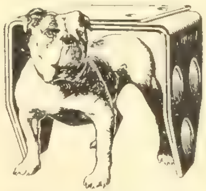

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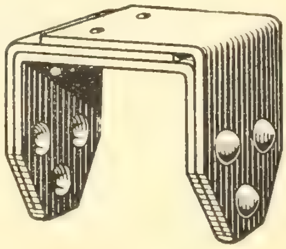

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Lumber (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver*
Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	94.50	65.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	45.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	135.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	145.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	**per M.**	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.25	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	70.00

PAINTS, OILS, COLOURS (delivered):—		Toronto	Montreal	Winnipeg	Vancouver*
White lead ground in oil, less than ton lots	per cwt.	13.25	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	14.50
Putty in bulk	per cwt.	5.95	4.25	5.50	6.50
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.33	1.40	1.26	1.56
Raw linseed oil, in bbls.	per gal.	1.35	1.38	1.23	1.53
Turpentine, in bbls.	per gal.	1.55	2.20	2.50	2.80
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45

PLASTER (Delivered):—		Toronto	Montreal	Winnipeg	Vancouver*
Hard wall plaster, sanded	per ton	13.50	15.00	25.40	26.00
Plaster of paris, in bbl. lots	per bbl.	5.50	5.35	1.60 bag*	7.50
Plasterers' hair	per bag	2.50	7½ cts. per lb.	1.00 bu.	1.50

LABOR:—		Toronto	Montreal	Winnipeg	Vancouver*
Bricklayers	per hr.	1.00	.80–.90	1.15	1.06¼
Structural Iron Workers	per hr.	.85	.50–.75	1.25	1.00
Plasterers	per hr.	1.25	.80	1.05	1.06¼
Hoisting Engineers	per hr.	.70–.80	.50	.90–1.10	1.00
Plumbers	per hr.	.90	.60–.75	1.00	.90
Carpenters	per hr.	.90	.65	.90	.81¼
Painters	per hr.	.75	.55–.65	.80	.81¼
Electrical Workers	per hr.	.80	.65	.70– .90	1.00
Roofers	per hr.	.65	.65		.90
Laborers (Common)	**per hr.**	.40–.50	.30	47½–.55	.50–.56¼
Laborers (Skilled)	**per hr.**	.60- 70			.90
Sheet Metal Workers	per hr.	.80			

LUMBER:—*Owing to the general unstable condition of the present lumber market, Vancouver dealers refuse to quote any prices at all especially for Prairie or Eastern publication. The prices are, moreover, fluctuating from day to day. Such prices as we quote are, therefore, averages and not standard.

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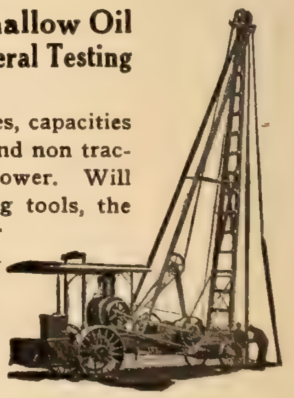

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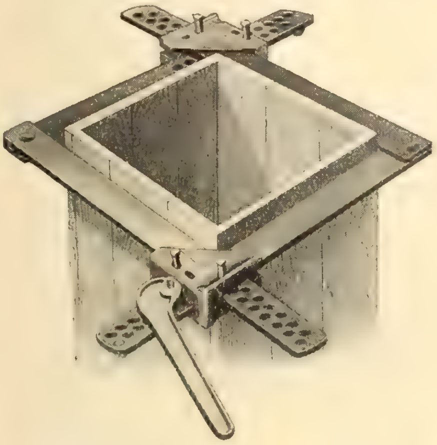

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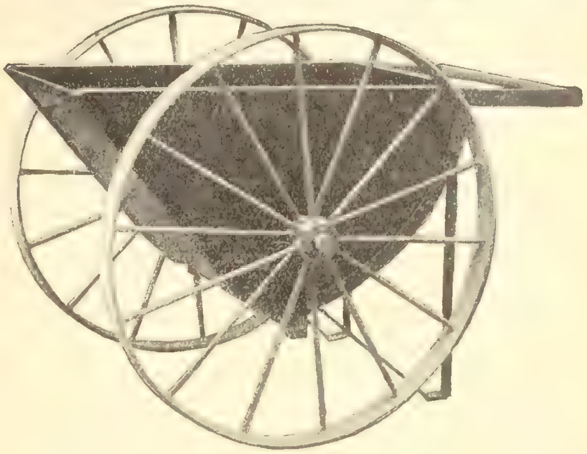

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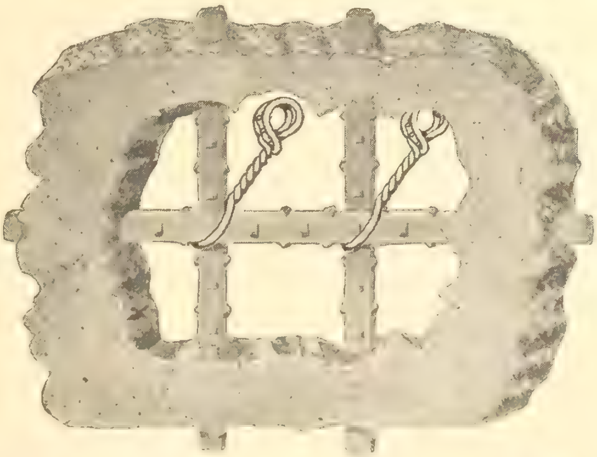

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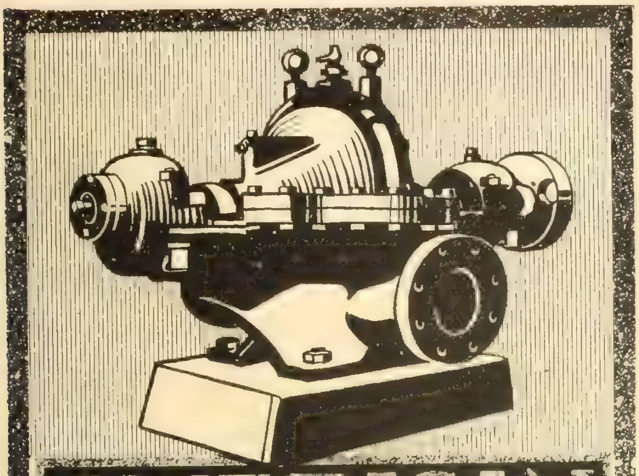

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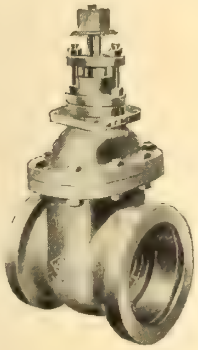

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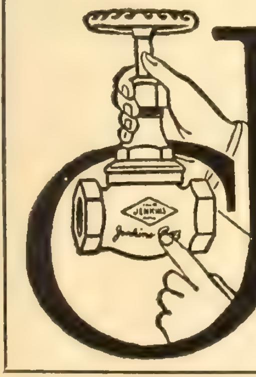

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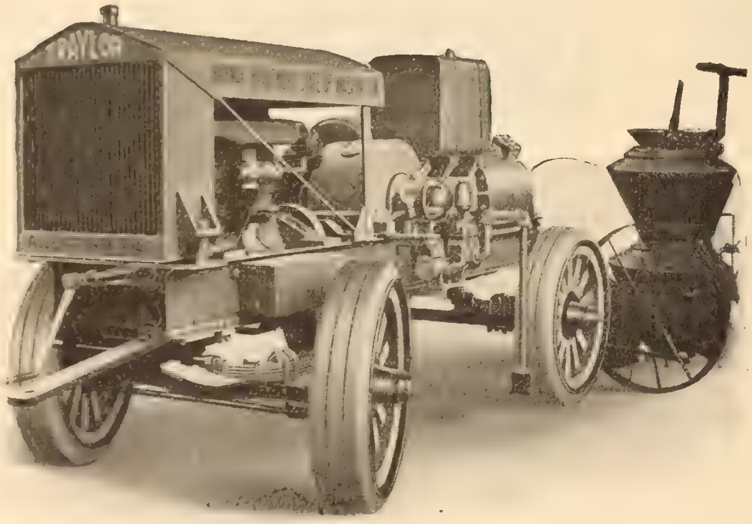

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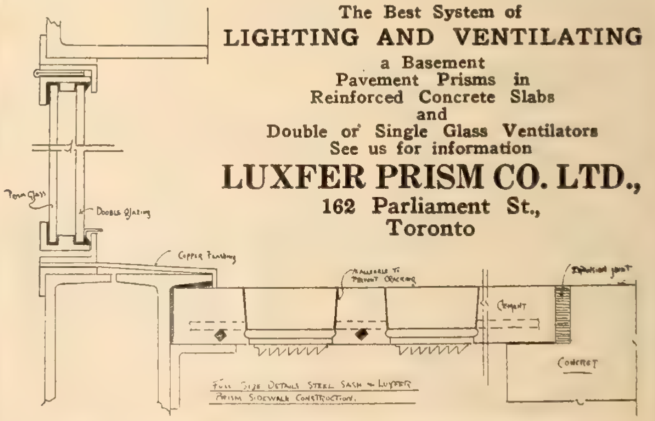
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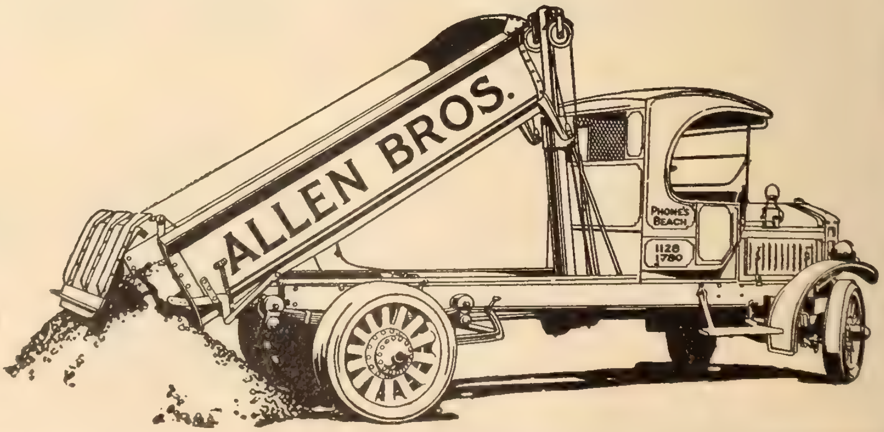

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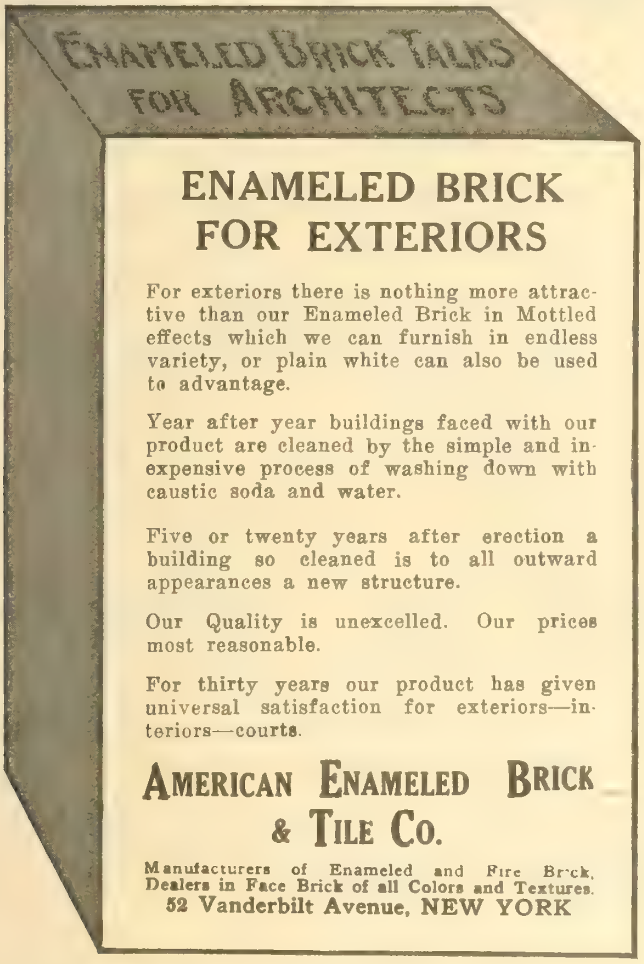

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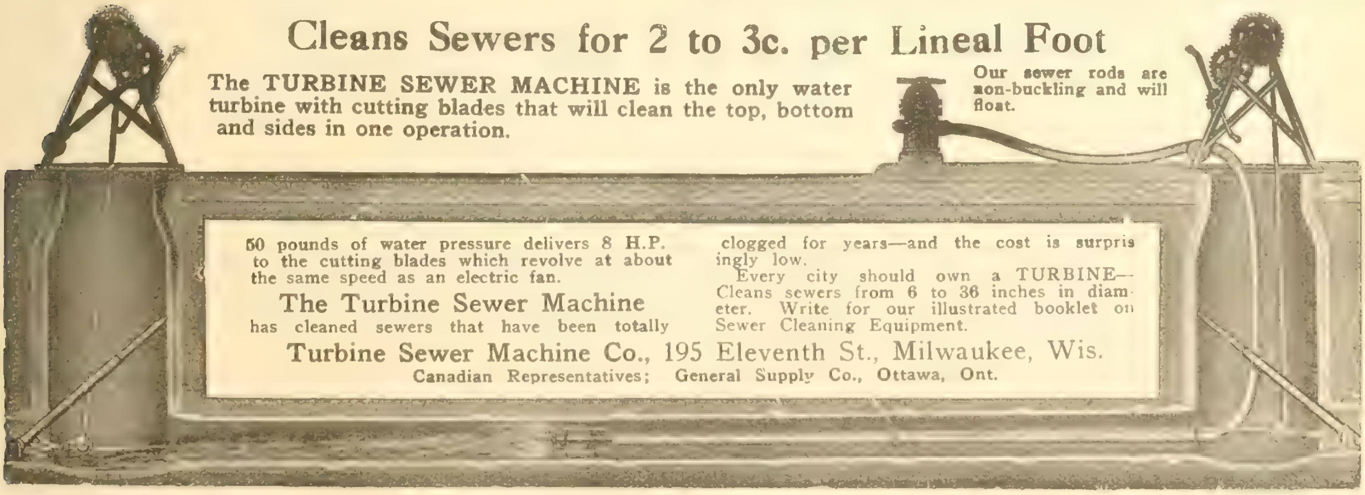

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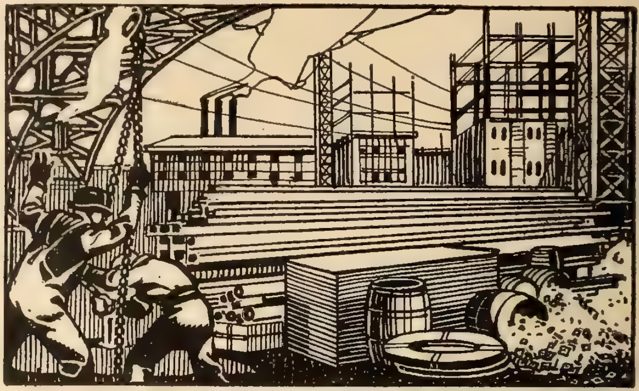

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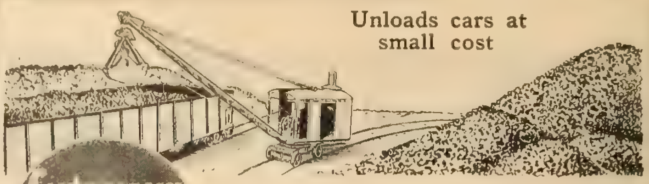

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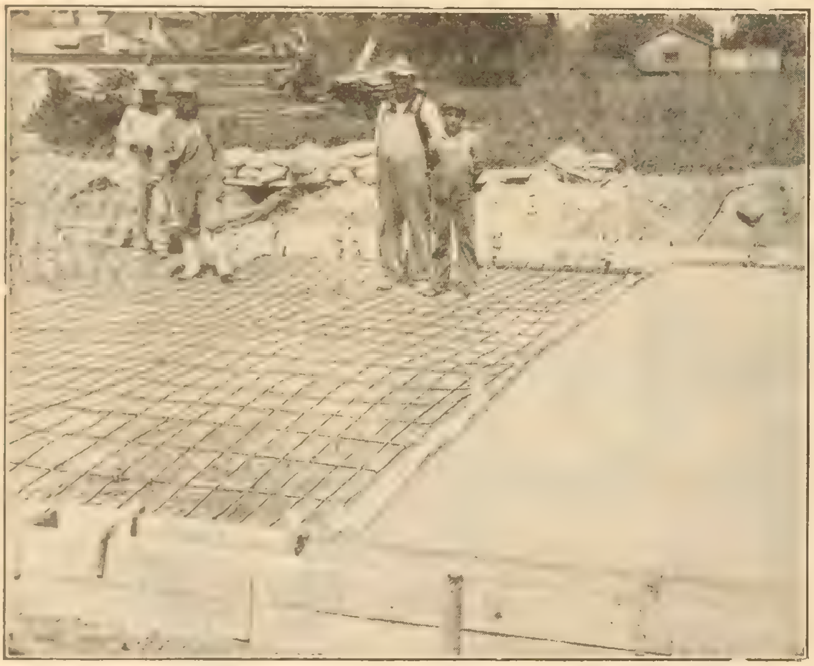

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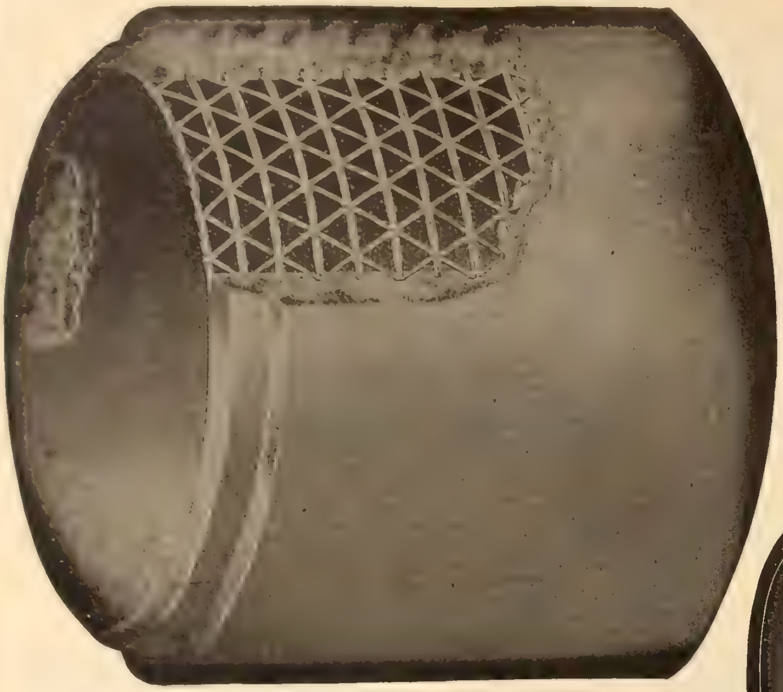

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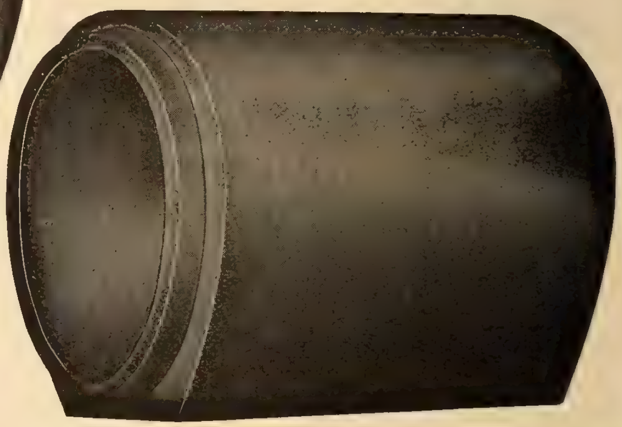

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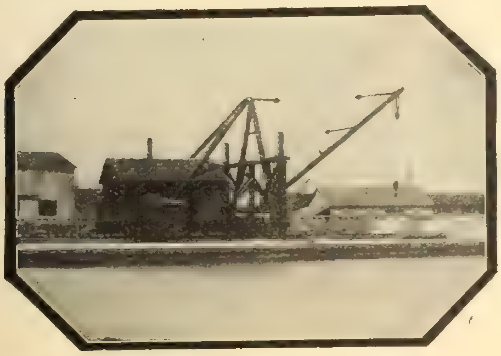

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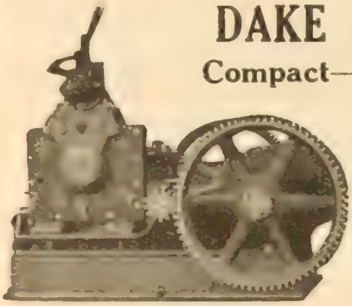

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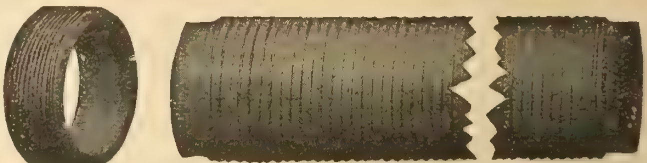

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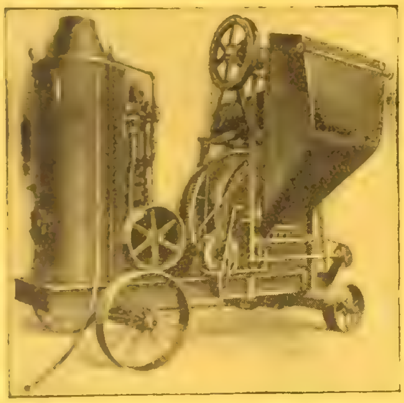

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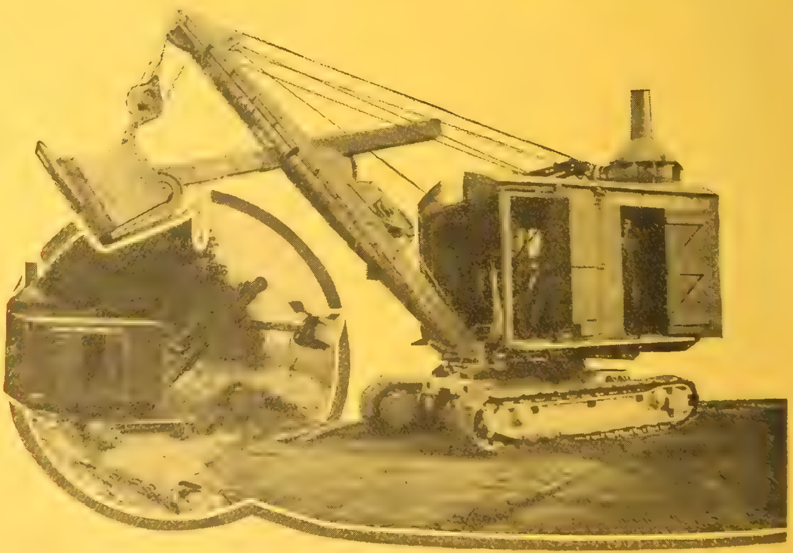

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Vol. 37 Toronto, August 29, 1923 No. 35

Contract Record and Engineering Review

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Alphabetical Index to Advertisers Page 16 Classified Directory to Advertisements Page 6

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COMBINING of these two operations into one simultaneous operation instead of two "stop-and-go" operations means speed in handling materials — a greater ability of the Koehring to work in closer quarters and under a broader range of conditions. "Boom and Hoist" is a distinctive Koehring feature in that the Koehring is *designed* for this combination operation, and inflicts no penalty of excessive wear.

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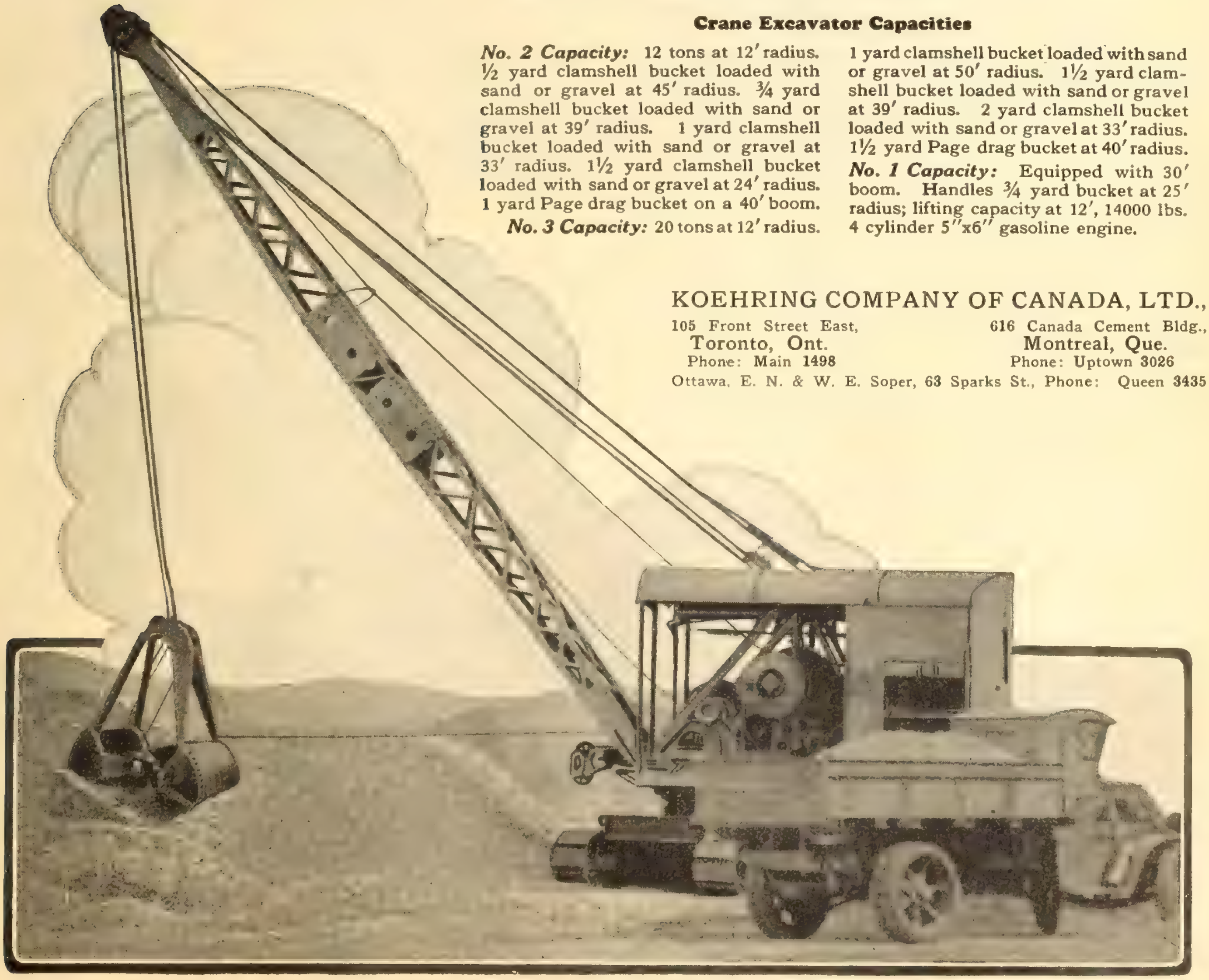

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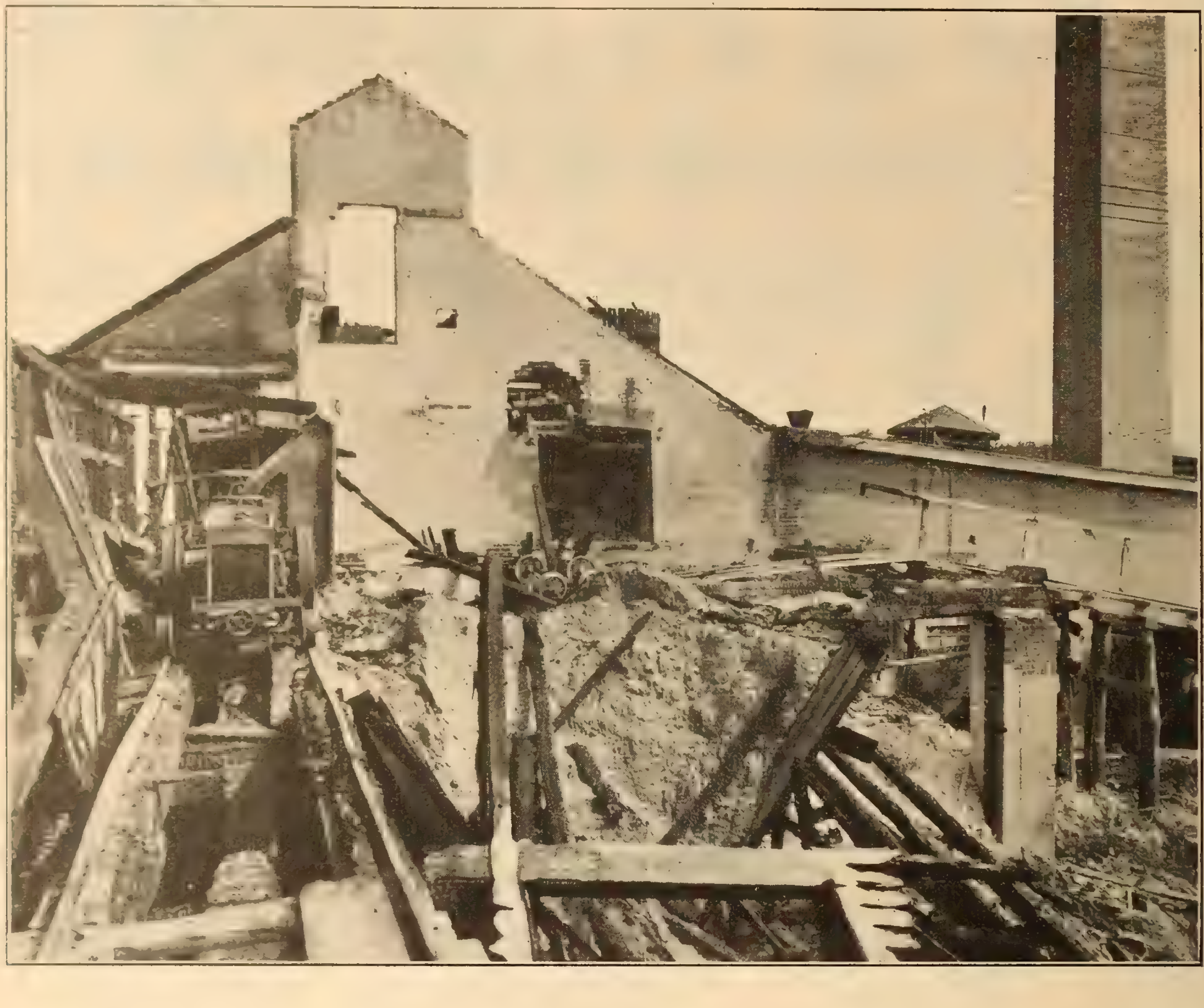

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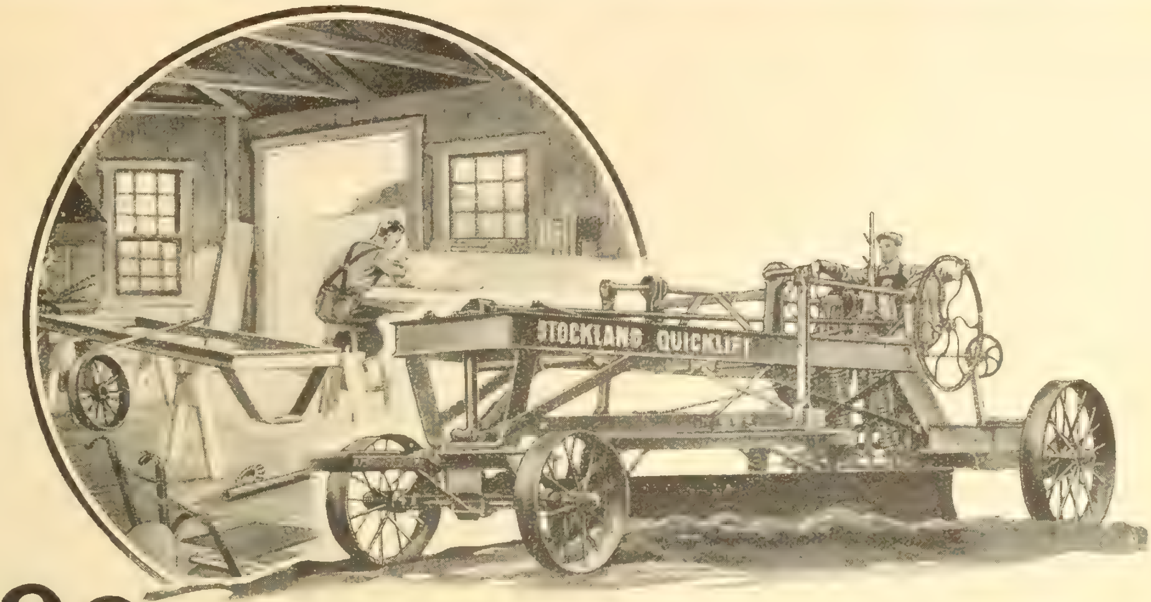

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On inspection you'll find the Stockland a carefully built machine throughout. Every detail of its construction is properly attended to—nothing is slighted or skimped in an effort to meet a price at the expense of strength, durability, economy of operation or ease of handling.

Write for literature on the Stockland 1923 line. Know the facts before you decide.

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  - [illegible] Ingersoll Rand Co.
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  - Canadian Welding Works
  - Northern Architectural Iron Works
  - Canada Wire & Iron Goods Co.
  - McGregor & McIntyre
  - [illegible] Iron Works Ltd.
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- Ash Hoists
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(Continued on page 8)

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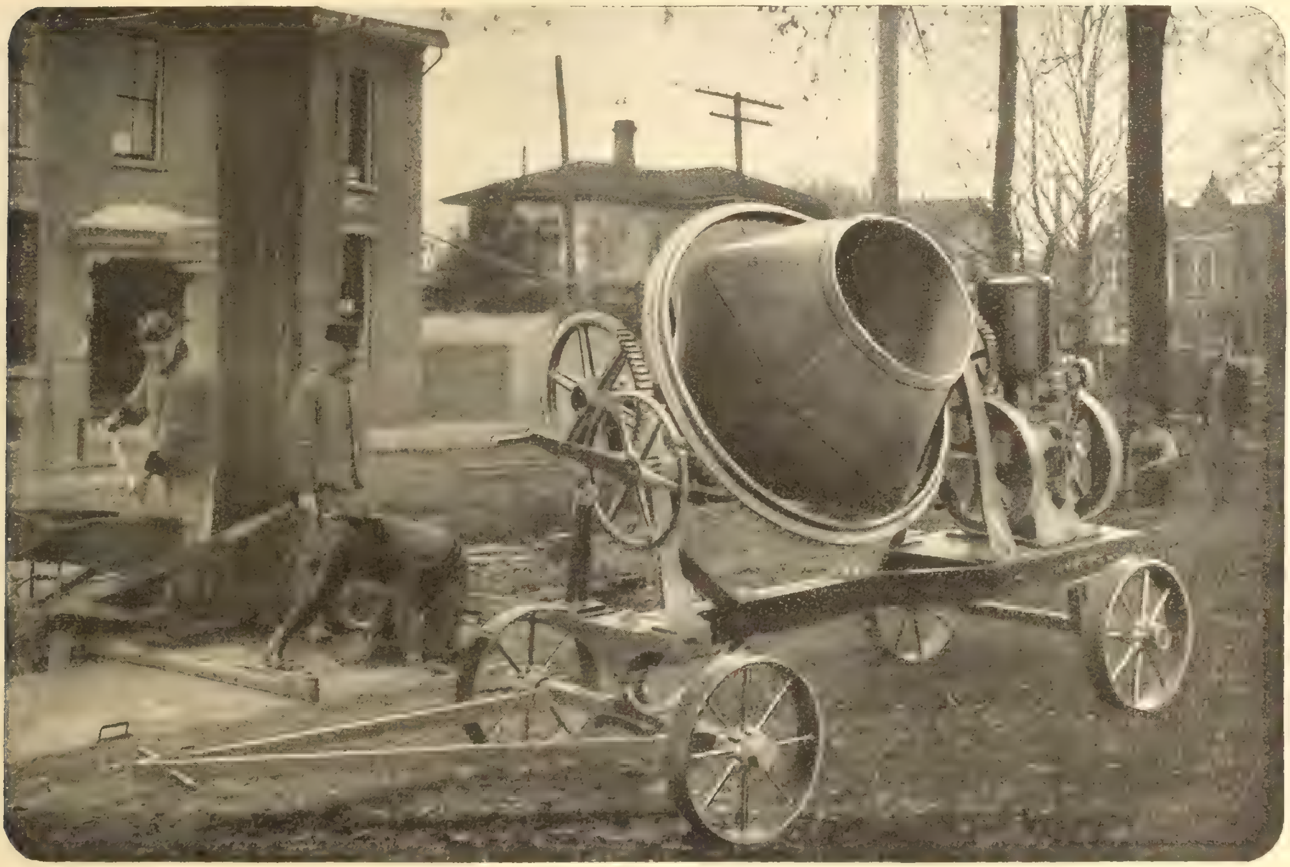
MACHINERY
"MOVES THE EARTH—
MIXES THE CONCRETE"
TRADE MARK

The CUB~HEX

A LIGHT~TYPE PORTABLE CONCRETE MIXER



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Its greater speed and the perfect mix, possible only with the famous Austin Cube principle, will save the contractor many dollars on the smaller jobs.

Its output of perfectly mixed concrete or mortar cannot be equalled by any other type of mixer, and it has honestly earned its reputation as the GREATEST UTILITY MIXER ever produced.

Illustration shows engine exposed, standard equipment is supplied with sheet metal housing entirely enclosing same.

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WOODSTOCK, ONT.

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Spielman Agencies Regd.

Electrical Contractors
Canada Electric Co.

Elevator Doors
Ormsby Company, A. B.

Elevators
Canadian Link-Belt Co.
Jeffrey Manufacturing Co.
Otis-Fensom Elevator Co.
Turnbull Elevator Company

Enameled Brick
American Enameled Brick & Tile Company

Engines
Canadian Blower & Forge Co.
Canadian Ingersoll Rand Co.
Clyde Iron Works Sales Co.
Fuller & Johnson Mfg. Co.
Hopkins & Co., Ltd., F. H.
Inglis Co., John
Laurie & Lamb
Le Roy Company
Sterling Engine Co.
Waterous Engine Works Co.

Engines—Swinging
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.

Engines (Civil and Mechanical)
Chipman & Power
Hunt & Co., Robt. W.
Milton Hersey Company
Lea, R. S. & W. S.

Excavators
Ball Engine Co.
Buckeye Traction Ditcher Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Engineering & Machine Works of Canada Ltd.
Erie Steam Shovel Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
Lumsden Engineering & Contracting Co.
Mussens Limited
Thew Shovel Co.

Exhausters
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Exhaust Heads
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Fans
Jeffrey Manufacturing Co.
Canadian Blower & Forge Co.

Fans, Disc
Canadian Blower & Forge Co.
Jeffrey Manufacturing Co.
Sturtevant, B. F. & Co.

Fans, Multivane
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Fans, Propeller
Canadian Blower & Forge Co.
Sturtevant, B. F. & Co.

Fans, Silentvane
Sturtevant, B. F. & Co.

Filters, Water
Laurie & Lamb

Fireproofing
National Fireproofing Co.

Fireproof Doors and Windows
Fireproof Door Company, Ltd.
Mussens Limited
Ormsby Company, A. B.

Fire Escapes
Canadian Des Moines Steel Co.
McGregor & McIntyre

Fittings
Crane Limited
H. Mueller Mfg. Co., Limited
York Manufacturing Co.

Fixing Devices
Inventions Limited
Rawplug Co., of Canada

Flag Poles
MacKinnon Steel Company
McGregor & McIntyre

Floor Clips
Western Steel Products Limited

Floor Stands
Jenkins Bros. Ltd.

Flooring Materials
Carmichael Ltd., A. W.
Imperial Oil Company, Ltd.
National Fireproofing Co.
Vitrified Clay Pipe Publicity Bureau

Forges
Canadian Blower & Forge Co.

Furnaces
H. Mueller Mfg. Co., Limited

Gantry and Cantilever Cranes
Orton & Steinbrenner Co.

Gasoline Engines
London Concrete Machry. Co.

Gears (Cut)
Hamilton Gear & Machine Co.

Gravel
Allen Bros.
Brantford Sand & Gravel Co.
Paris Sand & Gravel Co.
Rogers Supply Co.

Hammer Drills
Canadian Ingersoll-Rand Co.

Hardware
Hardware Co., of Toronto
Mercer Bros.

Hardwood Flooring
Eaton & Sons, J. R.

Hauling Contractors
Lumsden Engineering & Transport Co.

Heating Apparatus
Canadian Blower & Forge Co.
Crane, Limited
Sturtevant, B. F. & Co.

Hoists, Electric
Canadian Austin Machinery
Canadian Link-Belt Co.
Clyde Iron Works Sales Co.

Hoists (Truck)
Dominion Truck Equipment Co.
Wood Hydraulic Hoist & Body Co., Ltd.

Hoisting Apparatus
Canadian Austin Machinery
Canadian Ingersoll Rand Co.
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
Hopkins & Co., Ltd., F. H.
Industrial Works
London Concrete Machry. Co.
Mussens Limited
Watson Jack & Co.

Hoisting Engines
Canadian Mead-Morrison Co.
Clyde Iron Works Sales Co.
General Products Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
London Concrete Machry. Co.
McGovern, T. J.
Mussens Limited
Turnbull & Co., Harvard

Hydrants
Canada Iron Foundries
Dominion Steel Products Ltd.
Kerr Engine Company
Gartshore-Thompson Pipe Co.
McAvity & Sons, T.
Hepburn, Ltd., John T.

Hydrated Lime
Melville Quarry Co.
Muldoon, Ltd., J.
Standard Lime Co.

Ice Making Machinery
Canadian Ingersoll Rand Co.
York Manufacturing Co.

Industrial Cars
Canadian Austin Machinery
Canadian Equipment Co.
Hopkins & Co., Ltd., F. H.
MacKinnon Steel Company
Mussens Limited

Inspection Engineers
Canadian Inspection & Testing Laboratories
Hunt & Co., Robt. W.
Milton Hersey Company

Insulating Compounds
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.
Standard Underground Cable Co., of Canada Ltd.

Jib Cranes (all kinds)
Hamilton Bridge Works Co.

Joist Hangers
Hamilton Bridge Works Co.

Kilns
Canadian Blower & Forge Co.
MacKinnon Steel Company

Lead Pencils
American Lead Pencil Co.

Lime
Standard Lime Co.
Muldoon, Ltd., J.

Hydrated Lime
Standard White Lime Co.

Lockers (Clothes)
Canada Wire & Iron Goods Co.

Locomotive Cranes
Ball Engine Co.
Canadian Austin Machinery
Canadian Equipment Co.
Canadian Link-Belt Co.
Erie Steam Shovel Co.
General Products Co.
Hopkins & Co., Ltd., F. H.
Koehring Co., of Canada
McGovern, T. J.
Mussens Limited
Orton & Steinbrenner Co.

Locomotive Steam
Canadian Equipment Co.

Locomotive Gasoline and Storage Battery
Canadian Austin Machinery
Fate-Root-Heath Co.
F. H. Hopkins & Co., Ltd.
Jeffrey Manufacturing Co.
Koehring Co., of Canada

Marble
Oakley & Sons, Geo.

Mechanical Rubber Goods
Jenkins Bros. Ltd.

Metal Lath
General Products Co.
Ormsby Company, A. B.

Meters
Builders Iron Foundry

Motors
Lincoln Electric Co., of Canada Ltd.
Sturtevant, B. F. & Co.

Oil Tanks
Canadian Des Moines Steel Co.
Hamilton Bridge Works Co.
Horton Steel Works, Ltd.
MacKinnon Steel Company

Orange Peel Buckets
F. H. Hopkins & Co., Ltd.
Orton & Steinbrenner Co.

Ornamental Iron
Canada Wire & Irons Goods Co.
Dennis Wire & Iron Works Co.
Meldrum Iron Works Ltd.

Ornamental Moulds
London Concrete Machry. Co.

Paint (Heated Surfaces)
Barrett Company, Ltd.
Spielman Agencies Regd.

Paints and Varnishes
Hopkins & Co., Ltd., F. H.
Spielman Agencies Regd.

Paints (Bridge and Structural Iron and Pipe Coating)
Britnell, Limited
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Spielman Agencies Regd.

Paving and Paving Materials
Barrett Company, Ltd.
Dom. Tar & Chemical Co., Ltd.
Imperial Oil Company, Ltd.
Lumsden Engineering & Contracting Co.
Standard Lime Co.
Pacific Coast Pipe Co.
Vancouver Wood Pipe & Tank Company

Pencils (Lead)
American Lead Pencil Co.

Penstocks (Wood Stave)
Hamilton Bridge Works Co.
Pacific Coast Pipe Co.

Perforated Metals
Canada Iron & Wire Works
Greening Wire Co., B.

Pile Driving Machinery
Canadian Ingersoll-Rand Co.
Canadian Mead-Morrison Co.
Clyde Iron Works
Hopkins & Co., Ltd., F. H.
Mussens Limited

Pipe (Concrete, Iron & Wood)
Canada Iron Foundries
Canadian Pipe Co.
Dominion Concrete Company
Gartshore, Thompson Pipe Co.
National Iron Corporation

Pipe Covering (Cold and Steam)
Canadian Johns-Manville Co.

Pipe and Tapping Machines
H. Mueller Mfg. Co., Limited

Pitch
Dom. Tar & Chemical Co., Ltd.

Planing Mill Exhausters
Canadian Blower & Forge Co.

Plaster
Britnell & Company
De Giorgio, Limited

Plastering
Hynes Co., W. J.

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Canadian Ingersoll-Rand Co.
Laurie & Lamb

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Power Engines
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Luxfer Prism Co.

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Canadian Blower & Forge Co.
Canadian Ingersoll Rand Co.
Canadian Mead-Morrison Co.
Cook, A. D.
Fuller & Johnson Mfg. Co.
General Products Co.
Goldie & McCulloch Co.
Hepburn, Ltd., John T.
H. Mueller Mfg. Co., Limited
Hopkins & Co., Ltd., F. H.
Inglis Co., John
Koehring Co., of Canada
London Concrete Machry. Co.
Mussens Limited
Waterous Engine Works Co.

Pump Valves
Jenkins Bros. Ltd.
Canadian Ingersoll-Rand Co.

Quarry Machinery
Hopkins & Co., Ltd., F. H.
McGovern, T. J.
Mussens Limited

Radiators (Steam Taps)
Canadian Johns-Manville Co.

Rails
Gartshore, John J.
Hopkins & Co., Ltd., F. H.
Mussens Limited

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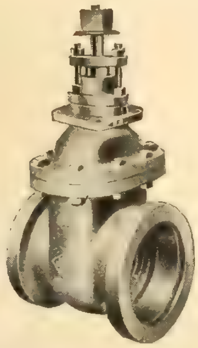

Fig. 400 F.M.

Regularly supplied to open by turning to the left. Can be furnished open to the right if desired.

This is Type "K" Jenkins Iron Body Standard Gate Valve

For Use With Indicator Post

Non-rising Spindle. **Hub Ends.**

Approved by the Fire Underwriters and, like all genuine Jenkins Valves, made to function satisfactorily under the strain of severe service.

You'll find this valve fully described in JENKINS Catalog No. 9—free on request.

JENKINS BROS. LIMITED,
Head Office and Works: 103 St. Remi St., Montreal
Sales Offices: Toronto — Vancouver
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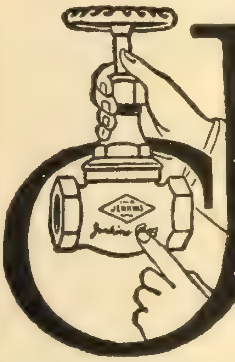
Factories: Montreal, Bridgeport, Elizabeth

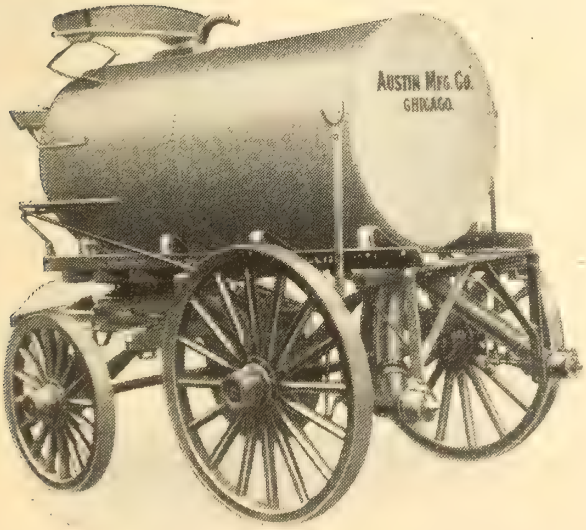


Always marked with the "Diamond"

Jenkins Valves

SINCE 1864

The oscillating fifth wheel doubles the life of the



AUSTIN

Street Sprinkler

Aside from the many improvements that years of study have incorporated into this tested and approved sprinkler, its exclusive patent oscillating fifth wheel puts it in a class by itself. This device ensures smooth, quiet, balanced action and removes racking strains inevitable in other types.

Write our nearest Branch for complete specifications and prices.

Exclusive Canadian Agents

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FAIRBANKS-MORSE CO. LTD.
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- Steel Chain
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  - Canadian Blower & Forge Co.
  - Canadian Des Moines Steel Co.
  - Hamilton Bridge Works Co.
  - Horton Steel Works, Ltd.
  - MacKinnon Steel Company
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  - Sturtevant, B. F. & Co.
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- Steel Sash
  - Ormsby Company, A. B.
  - Can. Metal Window & Steel Products
- Steel Sidewalk Forms
  - Heltzel Steel Form & Iron Co.
- Steel Wire Rope
  - Canada Wire & Iron Goods Co.
  - Greening Wire Co., B.
  - F. H. Hopkins & Co., Ltd.
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  - Sturtevant, B. F. & Co.
- Stone
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  - McGregor & McIntyre
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  - Reid & Brown Structural Steel & Iron Works
  - Sarnia Bridge Company
  - Standard Steel Construction Co.
- Swinging Gears
  - Clyde Iron Works
  - Dake Engine Co.
- Tanks and Steel Pipes
  - Canadian Ingersoll-Rand Co.
  - Canadian Welding Works
  - Canadian Des Moines Steel Co.
  - Hamilton Bridge Works Co.
  - Inglis Co., John
  - McGregor & McIntyre
  - Waterous Engine Co.
- Tanks Wood
  - Canadian Pipe Company
  - Vancouver Wood Pipe and Tank Company
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  - Dom. Tar & Chemical Co., Ltd.
- Tarpaulin
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- Testing and Inspecting Bureau
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  - Milton Hersey Company
- Tile
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  - Italian Mosaic & Tile Co.
- Tile Moulds
  - London Concrete Machry. Co.
- Tile Drain
  - Erie Clay Products Ltd.
  - National Fireproofing Co.
- Tile Hollow
  - National Fireproofing Co.
- Time Recorders
  - International Business Machines
- Towers
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  - Hamilton Bridge Works Co.
  - Horton Steel Works, Ltd.
  - Standard Steel Construction Co.
- Tractors
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  - Holt Manufacturing Co.
  - F. H. Hopkins & Co., Ltd.
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- Trailers
  - Dominion Truck Equipment Co.
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- Triangle Mesh Reinforcing, Road and Pipe.
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  - Jones Motors Ltd.
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  - Ruggles Motor Truck Co.
- Truck and Wagon Loaders
  - Jeffrey Manufacturing Co.
- Truck Units
  - Dominion Truck Equipment Co.
  - Wood Hydraulic Hoist & Body Co., Ltd.
- Trussed Wire Lath
  - Greening Wire Co., B.
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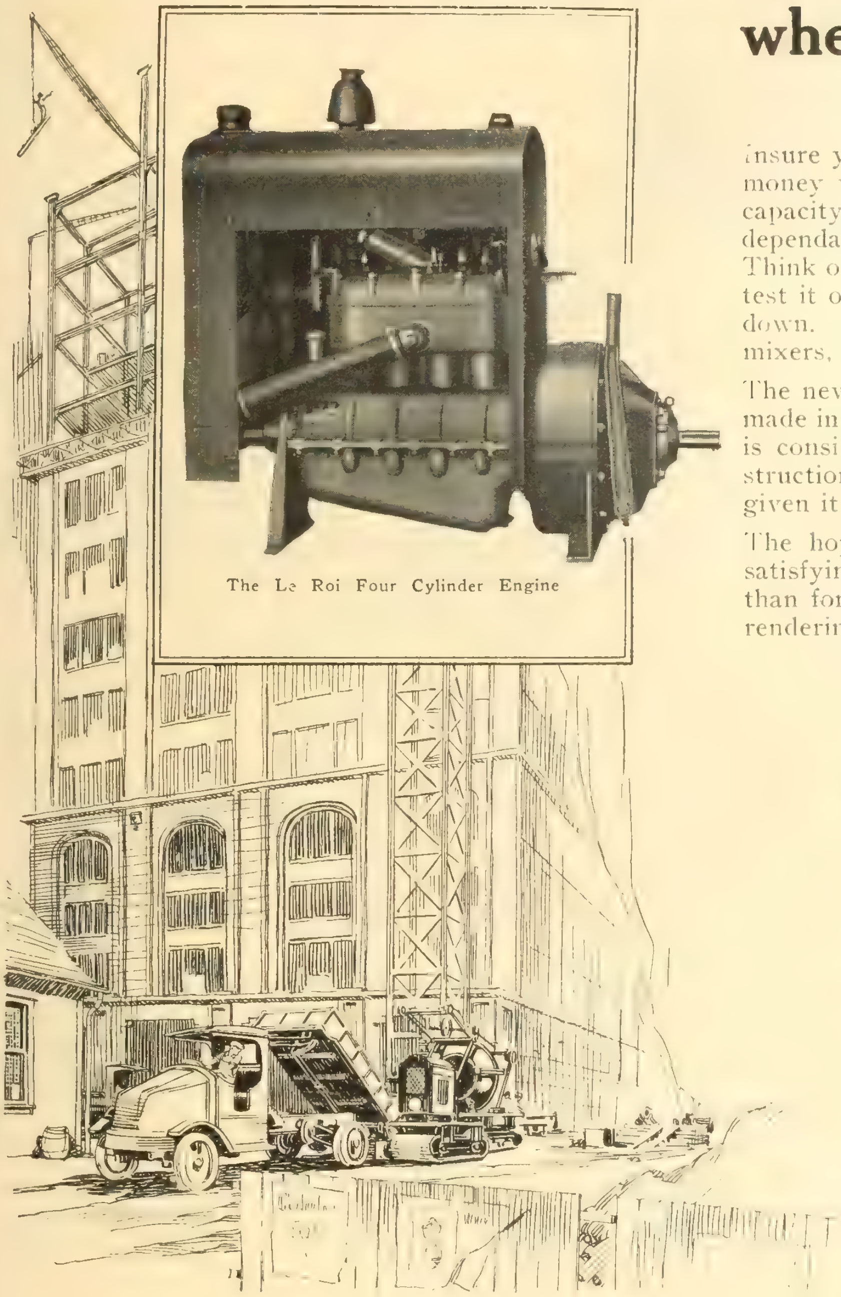
  - Canadian Steel & Wire Co.
  - Greening Wire Co., B.
- Wire Rope
  - Canada Wire & Iron Goods Co.
  - Dominion Wire Rope Co., Ltd.
  - Greening Wire Co., B.
  - Hopkins, & Co. Ltd., F. H.
  - Leckie Co., John
  - Mussens Limited
  - Canadian Pipe Company
  - Vancouver Wood Pipe and Tank Company
- Wood Lathes
  - Canada Machinery Corporation
- Wood Preservations
  - Barrett Company, Ltd.
  - Dom. Tar & Chemical Co., Ltd.

All the Power You Want

where and when you want it

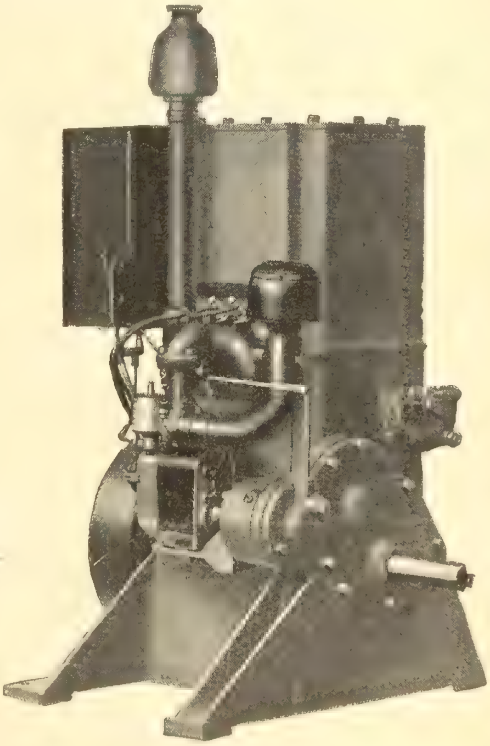


The Le Roi Four Cylinder Engine

Insure your next job against loss of time and money with a Le Roi. Ample power—extra capacity—extra strength; the smoothest, most dependable engines on the market to-day. Think of an engine so smooth running that we test it on our shop floor without being bolted down. Just the engine for use on concrete mixers, hoists, pumps, conveyors, etc.

The new Le Roi hopper cooled type which is made in two sizes (single and double cylinder) is considered a great advance in engine construction. Contractors and engineers have given it their hearty approval.

The hopper cooled type will give the same satisfying and lasting service that the more than forty thousand four cylinder engines are rendering.



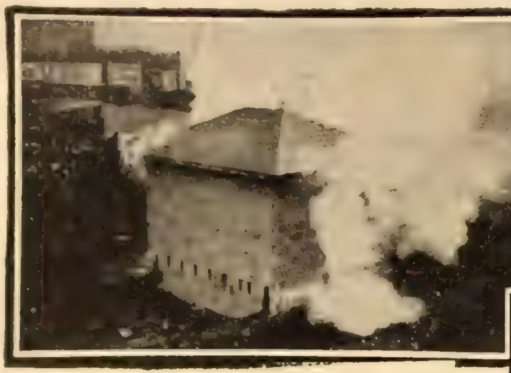
The Le Roi Hopper Cooled Type

Built in two sizes:
3 to 4 H. P. single cylinder.
5 to 8 H. P. double cylinder.
Built in three sizes:
Single, double and four cylinder,
3 to 15 H.P.

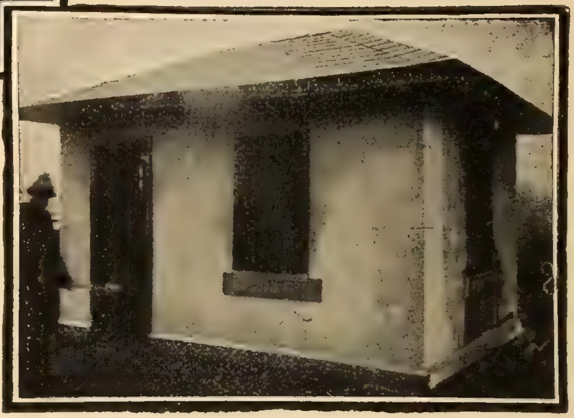
Let us tell you some interesting facts and figures about these reputable engines.

Le Roi Company
5906 Mitchell Street
Milwaukee Wisconsin

LE ROI ENGINES



Concrete Block Building as it appeared 20 minutes after fire was lighted. Water being applied



Appearance of Concrete Block Building after fire was completely extinguished

CANADA CEMENT
CONCRETE
FOR PERMANENCE

Concrete Materials Put to a Supreme Fire Test

An interesting demonstration of fire-proof home construction was arranged by the Concrete Products Association of Minnesota.

A house was built of Concrete Block, with Cement Stucco surface, Cement Asbestos Shingles, and Concrete Sills and Lintels.

This building, filled with highly inflammable material, was set on fire, and the fire permitted to rage thirty minutes.

Although the fire was extinguished by a heavy stream of cold water applied to the intensely hot walls, close inspection of the interior disclosed the fact that not a single crack was in evidence in either the Block, or Concrete Sills and Lintels. The only parts of the building damaged at all were the Doors and Window Frames of wood.

This test, and its remarkable result, serves to emphasize the sound structural qualities of Concrete Block Stuccoed. The Concrete Block gives strength and permanence. The Stucco lends beauty and charm, in addition to being weather-proof, fire-proof and rot-proof.

When it is considered that the walls of this fire-tested dwelling were only ten days old, and the Stucco and Plaster only three days old, the results of the demonstration are truly significant.

Specify
CANADA CEMENT
Uniformly Reliable

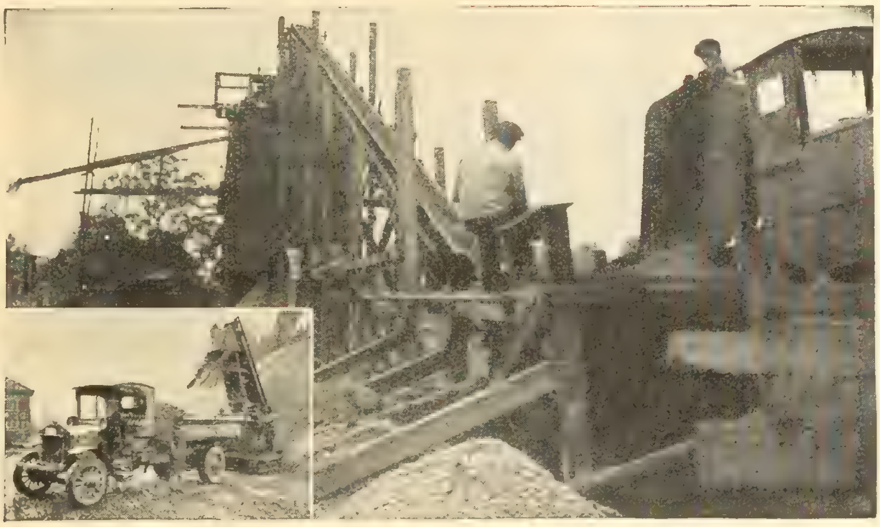
We maintain a Service Department to co-operate in all lines of work for which Concrete is adapted. Our library is comprehensive and is at your disposal at all times without charge.

Canada Cement Company Limited

Canada Cement Company Building Phillips Square Montreal

Sales Offices at Montreal Toronto Winnipeg Calgary

MUSSENS M LIMITED



One of the Barber-Greene Conveyors whose work is described on this page.
The photograph in the corner shows a Barber-Greene Bucket Loader loading trucks.

Increasing washed and screened gravel production 350 tons per day

By replacing a bucket elevator system with two Barber-Greene conveyors the White Marsh Sand and Gravel Company near Baltimore jumped up its production of washed and screened gravel from 50 tons a day to 400 tons.

And there have been no repairs since last July.

Two Barber-Greenes are used. One is a 96-foot permanent unit on which a 15 horse-power LeRoi engine drives the belt and 36 in. x 48 in. rotary screen.

The other is a 22-foot Portable and is used to load trucks from a ground storage pile. In another plant this company has a similar Barber-Greene installation.

The gravel handled is washed and screened and carried to bins or to a storage pile across the railroad track shown in the photograph reproduced above.

As hot weather reduces production

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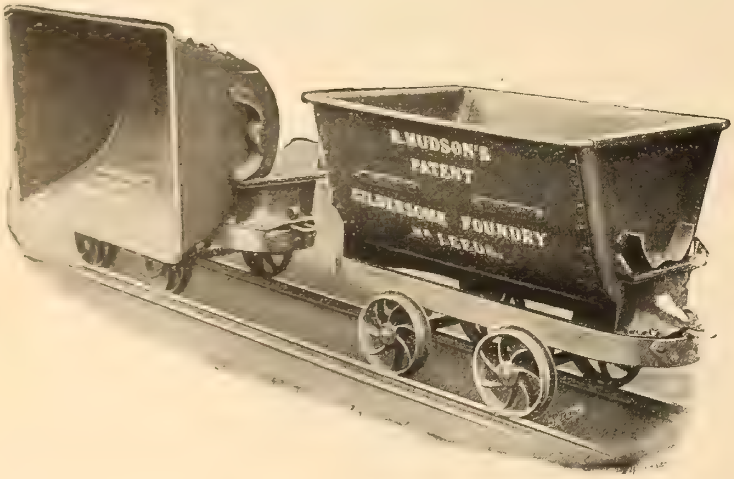

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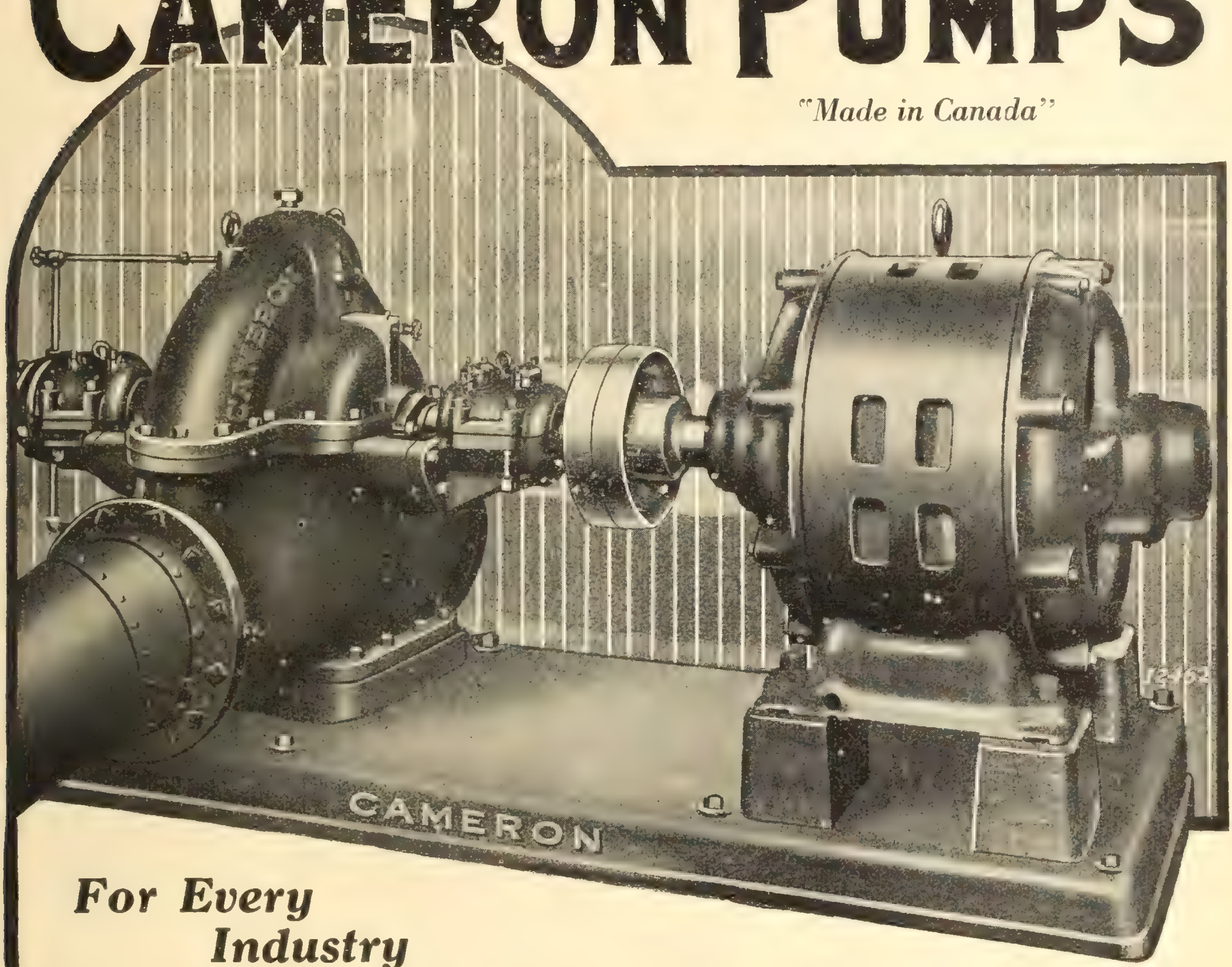

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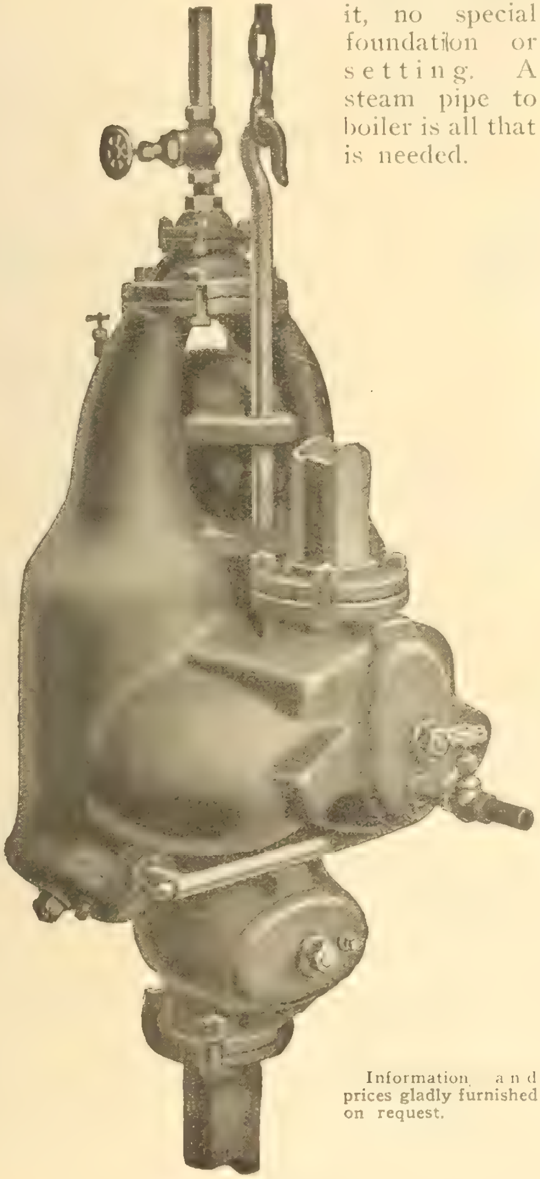

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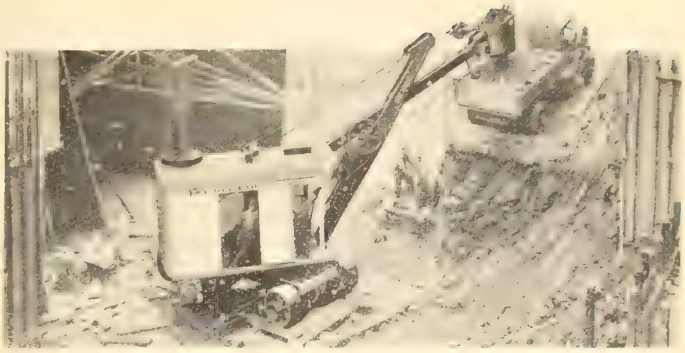

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The Wawa Hotel Disaster

The Wawa Hotel disaster, which cost eight lives, is, in a sense, a reflection on the building and construction industry. It is quite true that no direct responsibility attaches to any member of the craft but, at the same time, is there not a moral obligation somewhere? Should it be possible for such a death trap to exist—a home capable of accommodating some two hundred people and yet of such flimsy and inflammable construction that the whole thing was leveled in twenty minutes? It is difficult to place responsibility; possibly no law was transgressed; but, would the building industry not feel easier in its own mind, if, sometime in the past, it had registered a protest to the proper authorities and pointed out the possibilities of just such a tragedy as has occurred?

It is to be hoped this experience will be turned to profit by the owners of other similar summer hotels of which undoubtedly there are hundreds throughout Canada. Some provision should be made for rendering these buildings more fireproof. Dependable sprinkler systems are available; the house could be divided into sections separated by fireproof partitions; since ground space is not generally a factor there is no need for more than two storey buildings; all rooms could be provided with easy exits; a proper alarm system is a simple matter. The most distressing thing about the whole matter is the fact that it could have been avoided. Is it not up to the building and construction industry to move for the prevention of a similar tragedy in the future?

Straining the Forbearance of the Public

It would almost seem as if the irritating features of the many detours resulting from highway construction this summer are more formidable than usual; unless it may be that each year we hope that detours will be unnecessary and we are disappointed to find that they bloom perennially. One cannot help wondering, however, if the inconvenience and expense to which the general public is put by these detours is not greater than is absolutely necessary. Take the isolated case, for example, of the detour necessitated by the road construction work between Thornhill and Bond Lake on Yonge St. north of Toronto. Here it is necessary to travel west over a poor road a distance of three and three-quarter miles, north eight miles, and East again the same distance over a bad road. It is not only the time lost, which for commercial trucks must be a very big factor, but there is the wear and tear to every motor that has to make this trip. Surely it is not necessary to open up eight miles of road at the same time under such unfortunate circumstances, or if it is, conditions of detour travel should be made as favorable as is reasonably possible. For example, parallel roads should surely not be closed for repairs at the same time, as is the case of Vaughan Road at the moment, making it impossible for traffic travelling south to Toronto to use this road instead of returning to Yonge Street.

One continually hears complaints too, from motorists, that instructions as to the proper roads to follow are not sufficient. If one asks the man that is occasionally found in charge where the first detour is made, one simply gets a wave of the hand in a general direction. In the case of a big detour extending over a considerable period, such as that mentioned above, it would be a good idea, we believe, if brief printed instructions as to the proper route to take were available to hand to each motorist as he passed. The cost would be infinitesimally small and the satisfaction to the motorist to know that he was following the right course would be correspondingly considerable.

If the construction of our highways were in the hands of a private corporation the general public would not submit to the inconveniences they now suffer. There would be an immediate protest. Because it is evident that the general travelling public is endeavouring to meet the authorities half way and put as few obstacles as possible in the way of construction, this spirit of forbearance and co-operation

No. 96

Canada's Engineers—H. S. Nicklin

In January of this year Mr. H. S. Nicklin, who had been for four and a half years with the engineering department of the city of Guelph, received the appointment of city engineer of that municipality. He was born in Acton, Ont., 34 years ago. After his education at the Acton public and high schools, he joined the staff of the Merchants' Bank of Canada, progressing during the six years in their employ until he had attained the position of accountant. In 1911 he resigned from the bank to take up civil engineering at the University of Toronto. He specialized in sanitary highway engineering and took the degree of B.A. Sc. in 1915. During the summer vacations he gained very valuable engineering experience with Phillips, Stewart & Lee, Saskatoon; the sewerage department of the city of Saskatoon and with Murphy & Underwood, engineers, of Saskatoon. After graduation in 1915, Mr. Nicklin represented Murphy & Underwood as resident engineer at The Pas, Man., handling the filtration plant, domestic sewerage system, waterworks system and other municipal undertakings. He then served overseas with the Canadian Engineers, seventeen months of his service being spent in France as a sapper. On being discharged from the forces in 1919, he joined the staff of the city engineer of Guelph, Ont., receiving in May, 1920, an appointment as assistant engineer.

Mr. H. S. Nicklin

His promotion to full city engineer came in January, 1923.

should not be taken advantage of to too great an extent. We believe the inconvenience to the public is often considerably greater than is necessary.

Is Tax Exemption of Government Enterprises Justified?

There is growing interest in the question of taxing or exempting state-owned commercial enterprises. It appears that the principle of tax exemption applies even to the colonial government activities carried on in the British Isles, such as the Commonwealth Bank of Australia, the Canadian National Railways, the Canadian Government Steamship Lines and so on, for the activities, in England, of these different bodies has recently been brought to the attention of the public through the protest of the Federation of British Industries to the British Government against the existent practice. The Federation points to the "unfair competition" thus introduced between government-owned and privately owned commercial enterprise.

If it were possible to imagine a government-owned enterprise which did not enter into competition with private capital and which, at the same time, served the entire public to an equal extent, then there would not appear to be any serious objection to tax exemption. In every other case, however, the practice appears to be, as the Federation says, "unfair"—in direct proportion as these conditions fail to apply. If a tax-free government competes with a private company, that company is at a disadvantage; if it only serves part of the public, the unserved balance has to pay for privileges they do not enjoy. It is unfair and unjust and, further, it places government employees, who recognize the situation, in a more or less humiliating position. It is difficult, indeed, to understand how the advocates of tax exemption justify such a policy. It is probably pretty close to the facts to say that they do not try to justify it—they just do it. One cannot easily conceive, indeed, why they want to do it that way, unless it is that the public are to some extent mislead into thinking they are getting more for their money than is actually the case.

Government ownership in one form or another is very strongly entrenched in Canada. There is no desire on the part of the public, however, to do otherwise than operate on a sound, permanent basis. The idea of exemption from taxes caught the public fancy temporarily because it seemed to relieve them from one of the most objectionable burdens in this life. Little by little they will see—are seeing—that the arguments in its favor are not sound. In the interests of the continued popularity of the public ownership, it would seem to be wisdom for its advocate to remove such a shaky plank from their platform before it becomes a real source of weakness, before the public demands explanation of a policy for which there is no logical defence.

Building Permits for July

The value of prospective building in fifty-six cities showed a further decrease during July when, according to reports tabulated by the Dominion Bureau of Statistics, the building permits issued declined to $12,544,137 from $14,345,573 in June. In July of last year they had stood at $15,477,545. There was, therefore, a reduction of 12.6 per cent in the first comparison and of 18.8 per cent in the latter.

Forty-five cities furnished detailed reports showing that they had issued some 1,200 permits for dwellings at an approximate valuation of $5,300,000, and for nearly 2,800 other buildings estimated to cost over $6,300,000. Since the erection of several houses, apartments, stores, etc., is very frequently authorized in one permit, the number of buildings to be put up would be somewhat larger.

New Brunswick, Manitoba, Alberta and British Columbia reported a higher value of permits issued than in June, the increase of $449,391 or 72.8 per cent in British Columbia and of $232,256 or 59.7 per cent in New Brunswick being the largest. The remaining provinces recorded declines. In Quebec the value of anticipated building fell from $3,987,550 in June to $2,442,017 in July, a decrease of 38.1 per cent. This was the largest loss registered, while the reduction of $1,149,662 or 14,2 per cent in Ontario was also extensive.

In comparison with the returns for July of last year New Brunswick and British Columbia showed increases, but elsewhere the value of the building permits issued declined. The British Columbian cities reported registered an increase of $148,105 or 16.1 per cent. Ontario recorded the largest decrease of $1,582,832 or 18.6 per cent, and Quebec came second with a loss of $1,088,853 or 30.8 pe rcent.

Montreal and Toronto registered declines in the value of the permits issued as compared with both June, 1923 and July, 1922; in Winnipeg there was a slight increase in the former and a large decrease in the latter comparison, while Vancouver reported gains in both cases. Of the smaller centres, Fredericton, Sherbrooke, Hamilton, Kitchener, St. Catharines, Sarnia, St. Boniface, Moosejaw, Edmonton, Lethbridge, Medicine Hat, South Vancouver and Victoria showed increases in both comparisnos.

The value of the building permits issued from the beginning of the year to the end of July showed a decline as compared with the corresponding months of 1922 but an increase over the same period of 1921, the figures being $83,598,348 for 1923, $85,742,989 for 1922 and $65,451,255 for 1921.

Canadian National Exhibition, Toronto, has the largest and most costly building on any permanent fair grounds the world over—the Coliseum—which cost $1,500,000 and has 8 1/4 acres under roof.

The Week's Developments in a Nutshell

The most important event of the week is the crash of the Home Bank. This failure has directly rendered a quantity of prospective building impossible. Indirectly it has adversely affected all business in that it has left the public in a certain state of doubt as to the stability of our whole financial structure.

The one bright feature of the Wawa disaster seems to be that it will ensure future buildings of this nature being constructed to a much higher standard.

The situation in Europe has been measurably cleared by the statement of the French president that France would pay her debts to other countries when Germany paid them. The feeling that France may have had it in the back of her head to default has been dispelled. It is pointed out by an authority who has made a study of conditions in France, that the work of reconstruction is going forward there in a very satisfactory way, that France's export trade is expanding and that within two years she will be back on a pre-war producing capacity. This in spite of Germany's resistance and failure to keep her obligations. The tenacity with which France holds to her determination to make Germany pay is occasioning surprise and admiration the world over. France thinks Germany can pay if she wants to. So do most people outside of France.

A prominent Canadian citizen just returned from England stated to the writer that conditions are much better there than the ordinary reports would lead us to suppose. Factories are much busier, money is much more plentiful, people are much happier than they were a year ago.

Reports from points throughout Canada indicate that general trade is fair to good and the building industry holding its own. Prices of building materials are firm. Building Products & Fuel Limited, Saskatoon, Sask., report for their district: "Notwithstanding the fact that work is quite limited, builders' supplies have been fairly active in every month up to July. Prices remained quite constant in all lines with perhaps the exception of clay products. There has been a noticeable reduction in the price of common brick and some reduction on face brick."

Baird & McCurdy, of Winnipeg, say: "Prices have been holding fairly firm all season in spite of the lack of building. Of course, all prices are set at a low margin of profit and on account of the demand being limited, there is no likelihood in a change of prices."

Speaking for conditions in general in the United States, the National Bank of Commerce makes the following statement: "Recognizing the favorable and unfavorable factors in the situation, the outlook is for good business for the remainder of 1923, and expectation of its continuance into 1924."

There is a continued slight tendency for steel prices to firm. The shorter day being conceded to steel workers must eventually be shown in the final products. Bands 3/16" and lighter are quoted 10 cents higher at Toronto; linseed oils and turpentine are 5 to 10 cents lower.

All Types of Mixers to be Standardized

Regulations Governing the Size and Rating of Tilting Machines Have Now Been Approved—Rules Applying to Non-tilting Mixers Have Been Somewhat Amended

In the Contract Record of August 15, page 793, reference was made to the standardization of non-tilting mixers by a joint committee. Tilting mixers have now been analyzed and provisions for their standardization drawn up. In addition some revisions have been made in the regulations governing non-tilting machines. The present situation so far as tilting mixers is concerned is now as follows:

1. Standard of Measurement.

(a) The standard of measurement of drum capacity shall be the cubic foot.

(b) The standard for water tank measurement shall be the U. S. Standard gallon.

(c) It is recommended that the question of rating engines and motors be taken up by the Joint Committee on Construction Equipment and motor manufacturers.

2. Rating of Mixers.

The size of the mixer shall be designated by a number indicating the nominal rating of the mixer according to its capacity in cubic feet of mixed concrete per batch.

3. Table of Aggregate Proportions.

A standard table of mixed aggregates derived from authoritative sources shall be adopted and published by the manufacturers. This table, based upon 40 per cent, of voids in the coarse aggregate and 3.8 cubic feet of cement per barrel, is as follows:

Proportions of mix	Resultant concrete per bag	Proportions of mix	Resultant concrete per bag
1—1½—3	3.55 cu. ft.	1—2½—4	4.85 cu. ft.
1—1½—3½	3.86 cu. ft.	1—3 —5	5.13 cu. ft.
1—2 —3	3.89 cu. ft.	1—2½—5	5.47 cu. ft.
1—2 —3½	4.20 cu. ft.	1—3 —5	5.83 cu. ft.
1—2 —4	4.52 cu. ft.	1—3 —6	6.50 cu. ft.

Values taken from Taylor and Thompson's Table of Aggregate Proportions

4. It is recommended to mixer manufacturers that two sizes under 7-S be adopted as standard; namely, the 3½ cubic foot and the 5 cubic foot; and that sizes below the 3½ be omitted from the standardization program for the present.

5. Standard Table of Batches

A standard table of batches, based upon the table of mixed aggregate provided under Article 3, shall be adopted and published by the manufacturers. This table is as follows:

Proportions of mix	Resultant concrete per bag cu. ft	Building mixers Maximum No. full bags per batch 3½—S	5—S	7—S	14—S	21—S	28—S	Paving mixers Maximum No. full bags per batch 7—E	12—E*	13—E*	21—E
1—1½—3	3.55	1	1	2	4	6	8	1	3	3	6
1—1½—3½	3.86	½	1	1	3	5	7	1	3	3	6
1—2 —3	3.89	½	1	1	3	5	7	1	3	3	6
1—2 —3½	4.20	½	1	1	3	5	7	1	2	3	5
1—2 —4	4.52	½	1	1	3	4	6	1	2	3	5
1—2½—4	4.85	½	1	1	3	4	6	1	2	2	4
1—2 —5	5.13	½	½	1	3	4	6	1	2	2	4
1—2½—5	5.47	½	½	1	2	4	5	1	2	2	4
1—3 —5	5.83	½	½	1	2	3	5	1	2	2	6
1—3 —6	6.50	½	½	1	2	3	4	1	1	2	3

The resultant concrete per bag is based upon 3.8 cubic feet of cement per barrel and 40 per cent of voids in the coarse aggregate.

Building mixer batches upon 1½ gallons of water per cubic foot of mixed concrete.

Paving mixer batches are based upon 1 gallon of water per cubic foot of mixed concrete and upon a maximum operating grade of 8 per cent.

6. Standardization of Mixer Equipment

(a) The 3½ cubic foot and the 5 cubic foot mixers may be equipped with power loaders and water tanks.

(b) Pressure water tanks shall withstand a working pressure of 150 pounds per square inch.

(c) Water connections on the 7-S and under shall be ¾ inch garden hose connections.

(d) Loading skips shall be made with closed ends on the 7-S and under.

(e) Auxiliary hoisting drums may be furnished on the 7-S and under.

7. Shafts, Keys and Keyways

A. S. M. E. sizes of shafts, keys and keyways shall be used.

8 Safety Devices

All working parts shall be guarded in accordance with the requirements of state laws.

9. Standard Nomenclature

The nomenclature of the Concrete Mixer Association, with such additions as may be later approved by the manufacturer, shall be adopted as standard.

10. Name Plate

(a) A name plate giving the standard rating of proportions of mix, shall be affixed to each the machine, and its capacity for different machine.

(b) Pending adoption of American standards, the plate shall state that the machine meets the standard A.G.C. requirements as approved by the Joint Comditte of Mixer Manufacturers and Contractors. (Note: A standard plate was adopted).

(c) Until such time as the Associated General Contractors can take definite steps for approval of batch capacities of the standard mixers, each manufacturer shall furnish to the A.G.C. an affidavit stating that the machines comply with the standards and will satisfactorily mix the batches listed on the name plate.

11. Use of Standard Plates

(a) Manufacturers conforming to these standard requirements shall be allowed the use of the A.G.C. name plate- it being understood that due to manufacturing and competitive conditions it may be necessary for manufacturers to continue their present non-standard sizes—it being further the sense that the manufacture of such non-standard sizes shall be eliminated by January 1, 1925.

(b) After September 1, 1923, any manufacturer bringing out a new size of mixer not in accordance with the established standards shall forfeit his right to the use of the A.G.C. name plate so long as he departs from the standards, it being understood that mixers larger than 28 feet and under 3½ feet are not taken into consideration in this connection.

New Non-Tilting Mixer Rules

Important revisions of the non-tilting drum mixer standards approved by the Joint Committee of Manufacturers and Contractors were made at the second meeting of the committee held in Chicago, July 30 and 31. As the result of further investigation of provisions previously considered and suggestions received from construction companies, the manufacturers approved the production of the 21-S mixer, increased the maximum grade for rating paving mixers to 8 per cent and eliminated the water level capacity method of rating drums.

Concerning the rating of the drums, it was found that the water level method failed to account properly for such factors as blade arrangement and material carried in suspension, thus in a manner tending to discount ingenuity and improvement in drum designing.

To insure that no manufacturer is handicapped by a rigid stipulation where his machine is capable of handling the stipulated batch though the water level capacity of the drum may be low, a general provision to insure capacity and compliance with the standards was adopted.

The revised provisions follow:

1. Standard of Measurement.

(a) The standard of measurement of drum capacity shall be the cubic foot.

(b) The standard for water tank measurement shall be the U. S. Standard gallon.

(c) The rating of boilers, steam engines and gas engines, shall be referred for advice to the American Society of Mechanical Engineers, and the rating of motors to the American Institute of Electrical Engineers.

2. Rating of Drum

(a) The size of the mixer shall be designated by a number indicating the nominal rating of the mixer according to its capacity in cubic feet of mixed concrete per batch.

(b) The maximum operating grade to be considered in the rating of pavers is 8 per cent.

3. Table of Aggregate Proportions.

A standard table of mixed aggregates derived from authoritative sources shall be adopted and published by the manufacturers. This table, based upon 40 per cent. of voids in the coarse aggregate and 3.8 cubic feet of cement per barrel, is as follows:

Proportions of Mix	Resultant Concrete per bag
1—1½—3	3.55 cu. ft.
1—1½—3½	3.86 cu. ft.
1—2 —3	3.89 cu. ft.
1—2 —3½	4.20 cu. ft.
1—2 —4	4.52 cu. ft.
1—2½—4	4.85 cu. ft.
1—3 —5	5.13 cu. ft.
1—2½—5	5.47 cu. ft.
1—3 —5	5.83 cu. ft.
1—3 —6	6.50 cu. ft.

4. Standard Sizes of Mixers.

(a) Three sizes of paving mixers shall be standard—namely, the 7-E, the 21-E and either the 12-E or 13-E depending upon the results of a referendum to the A.G.C. to ascertain which of these two is most desirable.

Based upon 40 per cent of voids in the sand and stone and a maximum of one gallon of water per cubic foot of mixed concrete these sizes are to handle whole sack batches, as indicated in the table under Article 5.

(a) Six sizes of building mixers shall be standard—namely, the 3½-S, the 5-S, the 7-S, the 14-S, the 21-S and the 28-S. Sizes below the 3½-S and above the 28-S shall be omitted from the standardization program for the present.

Based upon 40 per cent voids in the sand and stone and a maximum of 1½ gallons of water per cubic foot of mixed concrete, the adopted sizes shall handle whole-sack batches as indicated in the table of batches under Article 5.

5. Standard Table of Batches.

A standard table of batches based upon the table of mixed aggregates provided under Article 3, shall be adopted and published by the manufacturers.

(This table is the same as the table shown under article five of the Tilting Drum Standard provision).

6. Method of Measuring Drum Speed (double opening non-tilting drum only).

(a) The speed of the drum shall be measured in terms of the peripheral speed in feet per minute of the centre of mass of the water level content of the drum when stationary. Both this speed and the R.P.M. of the drum shall be given by the manufacturer. Application of this provision shall be subject to recommendation and approval of a committee consisting of the chief engineers of the following mixer manufacturing companies:

Austin Machinery Corporation; Chain Belt Company; Foot Concrete Machinery Company; Koehring Company; Lakewood Engineering Company; the Marsh-Capron Company; Ransome Concrete Machinery Company; the T. L. Smith Company.

(b) It is recommended that state and municipal departments specify the peripheral speed of the drum as here defined instead of the R.P.M.

7. Standardization of Mixer Equipment.

Building Mixers

(a) Extension power loaders shall be eliminated.

(b) Mixers shall be equipped with tanks of sufficient size to deliver the indicated quantities of water per batch at follows: 7-S, 12 gallons; 14-S, 22 gallons; 21-S, 32 gallons; 28-S, 42 gallons; 12-E, 22 gallons; 21-E, 32 gallons.

Pressure tanks shall withstand a working pressure of 150 pounds per square inch One tank shall be standard.

Water supply connections shall be furnished as follows: 7-S and under, three-fourth inch garden hose nipple; 14-S, one and one-fourth inch standard iron pipe connection; 28-S, two inch standard iron pipe connection; 7-E, one and one-fourth inch; and 12-E and 21-E, two inch standard iron pipe connection.

(c) Discharge control on one side only shall be standard, but may be furnished on both sides as an extra.

(d) Skips shall be made with closed ends.

(e) Standardization of wheels shall be referred to the Mixer Association for further investigation and report.

(f) Power discharge shall be eliminated as standard, but the manufacturers may furnish same on 28-S mixers as an extra.

Paving Mixers

(a) Only full caterpillar tread of four wheels shall be used on 12-E and 21-E machines, and four wheels only on 7-E machines.

(b) Maximum width of skip four feet from end shall be 100 inches.

(c) Power steering control shall be used in full caterpillar and hand steering on four wheel machines.

(d) Hand power boom swing only shall be used.

(e) Maximum speed of travel of mixer shall be 1½ miles per hour and minimum ½ mile per hour.

(f) The batch transfer derrick shall have a reach of 14 feet from centre line of machine as standard.

(g) Engine tools only shall be furnished on the 7-S mixer and under. On the 14-S, the 21-S, the 28-S, and on all paving mixers the manufacturer shall furnish all necessary special tools and a kit of standard tools to be agreed upon by the Manufacturers' Committee.

(h) An auxiliary hoisting drum may be furnished only on the 7-S, as special equipment.

8. Shafts and Gearing.

The size of shafts, keys, keyways, gears, and the composition of gears shall be referred to the American Society of Mechanical Engineers for recommendation as to procedure in standardization.

9. Standardization of Power.

The question of standardization of power with reference to requirements for different machines shall be referred to the A.S.M.E. for advice as to proper procedure.

10. Safety Devices.

All working parts shall be guarded in accordance with the requirements of state laws. Paving mixers shall be provided with safety devices to protect men when the skip is being lowered.

11. Standardization of Names of Parts.

The nomenclature of the Concrete Mixer Association, with additions recommended by the Manufacturers' Committee above named, to bring this nomenclature up to date, shall be adopted as standard.

12. Name Plate. (same as for tilting mixers).

13. Use of Standard Plates (same as for tilting mixers).

Progressive Construction of Highways

A System that Provides Road Surfaces Adequate to the Needs of Traffic—Each Operation is a Step Toward a Higher Type—Nothing Needs to be Discarded

Traffic is concerned with the roadway only to the extent of being provided with a smooth highway over which it may travel at a minimum of operation cost. The selection of the type of highway to construct is the problem of the engineer, after due consideration of all affecting elements, and the one chosen should be a highway which will adequately and sufficiently carry the traffic at a minimum maintenance expense.

It is absolutely essential that the road should be selected and so constructed that the money invested in the system of highways will at all times be a minimum. To best do this means the construction of progressive type roads in which all the standard of construction are the same, and by the use of which the lighter traffic is provided with a road suitable to its needs, and the heavier traffic with a hard surface road, which is the ultimate surface of all progressive type roads.

Within highly developed sections the construction of a hard surface pavement is, no doubt, the only correct answer. In urban and outlying districts where the traffic is less intense a lighter and less expensive road may adequately serve the needs of traffic. This less expensive road should be located, graded and drained upon the same standards customary with hard surface construction, so that when the country, through which the road passes, develops to the extent that traffic requires a heavy duty road, there will only be the necessity of adding the hard surface in order to adequately provide for the heavy traffic which may at some future time make demands on this highway. Still farther from the highly developed centres and far out into the less developed country there are still lesser traffic demands. Few vehicles and light loads generally constitute the pioneers in transportation. Quite often, graded roads, with the proper drainage structures, constructed upon hard surface standards, will suitably take care of this rural traffic.

Higher Type of Road as Traffic Develops

After the construction of the graded road provides a means to development and the traffic demands become greater, a higher type surface, possibly a sand-clay, topsoil or gravel, may be added to the previously graded road, and when the locality continues to grow and become more highly developed and the traffic demands are greater, it only remains for the road builder to surface these progressive roads with a hard surface. This will efficiently provide for the heavy traffic, that ultimately makes demands on the roads in the developed localities.

Our method of progressive type construction is to grade the road, using the same standards for line and grade as are used in hard surface construction. Only one standard of drainage structures is used regardless of whether the road is merely graded or is to be covered with a hard surface. This construction of graded road will care for light traffic which generally exists in all newly developed localities. This graded road is at all times maintained and when the increased traffic creates a high cost of maintenance, it is then time to construct the next higher type of road surface. The next step in the progressive type road is to cover the graded road with a selected soil material, such as sand-clay, topsoil or gravel. This material is generally of higher bearing value than the natural soil and is a material which is less affected by moisture and therefore more suitable for use as a road surface. This selected surface material is maintained as a subgrade highway until such time as the maintenance cost becomes excessive and the increased traffic indicates that a hard surface roadway is necessary.

The cost of grading and the drainage structures generally constitute about one-sixth of the ultimate cost of a hard surface road. To add a selected soil surface adds very little difference to the cost of this construction; consequently about six times as much road, with a selected soil surface, may be constructed for the same money as when the money is spent for the immediate construction of hard surface roads. This makes it possible for transportation to be benefitted to a much greater extent and for the community to develop at six points rather than at one.

Nothing Discarded by the Progressive Method

It will be noted that the construction of the selected soil surface is an addition to the graded road and no previous step in the grading or construction of drainage structures has been lost or thrown away in the construction of this selected soil surface road.

In the progressive type road all steps taken in its construction include the utilization of all previous construction when transforming the road to the next higher type, and each step may be considered as a subgrade for the next higher type surface. This in itself justifies the expenditure of a sufficient amount of money to select soils of a character which may, with proper maintenance, be used as a surface material until such a time as traffic demands, or the cost of maintenance necessitates the construction of the next higher type of hard surface. By this method of construction the graded road or the selected soil surface can truly be called a subgrade highway, and is often the economic solution for road construction over a large portion of a highways system.

The ultimate step in progressive type construction is the addition of the hard surface. After the maintenance on the selected soil surface becomes excessive or when the country and traffic develops to the extent that a hard surface road is necessary, the next step is to construct the hard surface pavement directly on the selected soil surface. This method of progressive construction utilizes advantageously the selected soil surface as a stabilized subgrade for the hard surface pavement, and on account of the complete settlement and on account of the character of the selected soil surface, the subgrade is stabilized sufficiently to aid the hard surface in carrying the loads.

Therefore, it may be seen that with the construction of the progressive type road, light traffic or a small tonnage is cared for by a graded road of comparatively low cost. As the traffic demands and tonnage increase, the road is increased in strength and the increase of the investment is justified. As the traffic and tonnage increase to the maximum, a hard surface road is constructed. The construction of roads on progressive principles means that the greatest percentage of the invested money is in permanent construction, and justifies the expenditure of bond money in any progressive type road.—C. M. Upham, State Highway Engineer of North Carolina, before the American Road Builders' Association.

It is claimed that practically everything made in Canada from a fountain pen to a locomotive is on display at the Canadian National Exhibition. There are over 15,000 exhibits in all.

E. G. M. Cape & Co. Active in Ontario

An announcement in the Ontario Gazette records the incorporation of E. G. M. Cape & Company, to carry on a contracting business in Ontario. Heretofore, this company have confined their activities largely to the province of Quebec, directing their operations from their offices in the New Birks Building, Montreal. In that territory they have established a splendid reputation by virtue of the high order of work handled by their organization. They have been strong supporters of any movement aiming to improve the status of contracting industry, and Mr. Cape himself has been active in the affairs of the Association of Canadian Building and Construction Industries, having been on the executive board for some time.

Mr. L. H. D. Sutherland who is in charge of E. G. M. Cape & Co's. Toronto Office

In entering the Ontario field, E. G. M. Cape & Company are merely wishing to enlarge the scope of their operations and handle more widely distributed work for which they have an adequate organization and suitable facilities. A permanent Toronto office has been opened at 631 Confederation Life Building, in charge of Mr. L. H. D. Sutherland. At the present time the firm are engaged on one large contract in Toronto—the Gowans-Kent Building, for Cassidy's Limited, on Front street, west.

Mr. Sutherland, who has been with E. G. M. Cape & Co., for 13 years, has had charge of many of their large contracts during that time.

Ideal Subgrade is Elastic

Investigation has proven to a great extent that an ideal subgrade is not necessarily one which has the greatest resistance to deformation from loads but one which not only is fairly firm but is also elastic enough to recover from deformations. The continual movement of the pavement slab due to temperature stresses requires that the subgrade follow it to some extent in order that contact be made. On a perfectly rigid subgrade a slab would soon fail due to the fact that at certain periods of the day the edges alone would be bearing on the subgrade. Then too, at night when the edges of the slab curl up, a true cantilevered slab would be developed, whereas with an elastic subgrade the tendency would be to follow the slab and form contact with the result that some bearing would be obtained.

Cut Stone Often Carelessly Handled

The Appearance of the Finished Structure is Frequently Marred by Improper Care of Stone--Some Rules for Storing and Setting Ashlar and Trim—Skilled Workmanship is Needed

Too much attention cannot be given to the delivery of cut stone to the job. Whether it is plain sawn ashlar, or carved work, the same care in handling should be insisted upon that is accorded other materials used in the structure. The standard specifications that are issued to the architectural profession and to the cut stone trade by the service department of the Indiana Limestone Quarrymen's Association discusses this important subject in an appendix under the heading: "Handling, Setting and Protection of Cut Stones," that will bear repetition.

No one would think of throwing fine interior millwork, interior marble or other finished interior items around in the mud, but the very fact that stone is stone, seems often to be taken as an excuse for handling it with no more care than if it were a carload of rough rubble stone for foundation or other rough structural purposes. The finish of the exterior of a building is just as important as the interior, in fact more so, for more people will see it than will view the interior and as cut stone is the most important item used for exterior decoration it should be treated with due consideration of its worth. The architect responsible for the exterior appearance of a building cannot hope for good results unless he insists upon experienced and capable handling of cut stone. For this reason it is highly important that the architect control the sub-letting of this work under the terms of specification and contract. Too frequently cut stone is carelessly stacked at the building site and permitted to be used as the resting place of workmen or a depository for dinner pails and their contents, or worse still as the unloading dock for other materials. Cut stone should not be stacked in a manner that will permit its entire weight to rest on the arises. Soft wood strips and excelsior should be used to properly separate the finished faces when packed in piles and in addition to being placed on a platform raising it free from the ground it should be barricaded or fenced in when stored for long periods. Joints are an important element in design and snipped arises will impair the effect of the finished work.

The Necessity of Skilled Workmanship

Skilled workmanship in setting also is important, for it is frequently the case that stone of a lower grade if carefully cut and set will be made to appear equal in every way to the finest product of the quarry. It is equally true that improper handling of the high grade stone will result in it having the appearance of a lower grade material. While some architects specify that all stone weighing 80 pounds shall be set by derrick, this is rather a low limit and it is considered safe in practice to allow the exact methods of handling to an experienced setting contractor. A difference of opinion exists as to whether stone weighing around 100 pounds, or more, should be Lewis holed. Some building codes require that all stone of 100 pounds, or more, in weight be lifted with Lewises, while other cities permit grab hooks to be used generally for the setting of ashlar and most other stone weighing up to 300 to 400 pounds. In view of these varying practices it is always well to consult local building codes before making specifications on this point.

Practice has determined that soft pine, white wood or spruce make the best wedges for use in setting limestone. These wedges should be 2½ to 2¾ inches long and ⅞ of an inch wide and ½ inch thick at the butt and tapering to an edge of 1/16 to ⅛ of an inch. It is also important that these wedges be thoroughly soaked in water before use so that they will shrink with the drying out of the mortar. Dry wedges, on the other hand will swell by the absorption of moisture from the mortar, sufficiently in many cases to lift the stone and destroy the mortar bond in joints or to spall off the face of the stone, or they may cause spalling of the stone later on by the difficulty of removal when the building is being cleaned down and pointed. Thoroughly soaked wedges of soft wood will shrink sufficiently to make their removal easy and without damage to the stone.

Setting Large Blocks

For the setting of large columns and drums, bases for statuary and other large stones, lead buttons or pads have been found to be more satisfactory than wood wedges. These buttons are made from square or circular pieces of sheet lead which are cut from 3/16 to ¼ inch thick sheets of lead according to the thickness of the joint desired. For columns they are usually about 1 1/3 inches square set three inches back from the face of the column. These buttons serve to arrest the uneven descent of the block and assure the proper and even bedding without the possibility of snipping the edges and to prevent the improper squeezing out or crushing of mortar during the process of hardening. All large blocks should have the joints thoroughly filled with a mortar sabre or saw blade, or other tool, until the block appears to be floating on the mortar bed.

In setting cornices, belt courses and copings it is highly important that the vertical joints projecting from the face of the building, the top members of all main cornices and copings and balustrade rails be thoroughly filled with setting mortar, or otherwise the passage of water is almost certain to disfigure an otherwise fine piece of work. As these vertical joints cannot be properly filled simply by slushing up at the time of setting they should always be grouted solid, and it is a mistake to make these joints less than the full ¼ inch regardless of the thickness of the joints elsewhere on the work. The stone should be set with the vertical joints and the exterior profile of the members caulked with picked oakum or newspapers soaked in water and the joint poured full with as thick grout as can be properly worked into them, allowing the usual ¾ inch of depth at the top of joint for pointing up later. The caulking is later removed, providing the necessary space for pointing up the joints.

Advice is also given on details of setting for arches, ribbed vaults, sills, and the use of temporary coverings and stain prevention for finished work is strongly advised. This work, while more properly included in rough carpentry is often made a part of the general masonry contract. The little outlay of money required to insure proper protection of finished stone work is amply repaid in the appearance of the structure free from stains and chipped masonry.

Working Stresses for Structural Timbers

The working stresses for structural timbers of various species given here are the result of a long series of tests by the Forest Laboratory at Madison, Wisconsin, on small clear specimens and timbers containing defects. They are applicable to beams, joists, girders, and short columns graded in accordance with the Forest Service basic grading rules for structural timbers. Commercial grading rules were found in general to be too indefinite in their limitations of the size, number, and location of defects to make it practical to establish working stresses for them, even if tests could be carried out on every grade found in the local markets.

The stresses given in the table are for timbers of the Forest Service base grade, Select (S2). From them the stresses permissible for the other three basic grades can be easily computed. With Extra Select (S1) timbers of any species a stress 7/6 as large as the stress given in the table may be used. Standard (S3) timbers should be subjected to only 5/6 the listed stress. Common (S4) timbers can take only 4/6 the stress given for select (S2). The working stresses of the different grades of Douglas fir and southern yellow pine can be increased one-sixth the allowable stress given in the table for the basic or select (S2) grade if the material meets the density requirements of the American Society of Testing Materials.

A "factor of safety" adjustment of the test values has been made to take care of the loss in strength from defects, the effect of long continued loads, the variation of individual pieces from the average, and the possibility of slight accidental overloading. It is evident that a large part of this "factor of safety" is required to correlate laboratory test results with actual conditions of use, and only a small part of it may be considered a true factor of safety. The application of a load which would produce three times the working stress given as allowable would be expected to cause the immediate failure of some of the timbers and the ultimate failure of 75 per cent of them. In fact, the application of loads which would produce stresses only one and one-half times the working stresses recommended would be expected to cause occasional failures if the loads were left on for any great length of time.

Concrete Block and Brick Manufacturers Adopt Standard Size

Firms in the United States making machinery for the production of concrete building units have adopted standard sizes for concrete brick and block. Action in this direction was taken at a meeting of representatives of the manufacturers held July 30-31 at Chicago. The determining of standards for concrete building tile was placed in the hands of a committee, which is to report at a meeting to be held in February, 1924.

The standard size determined for concrete brick was 2½ x 3¾ x 8 inches. The standard size for concrete block was established as 7¾ inches high by 15¾ inches long, while widths may be 6, 8, 10 and 12 inches according to the wall thickness that has been designed or is required by local building codes. Sizes others than those indicated will be designated as "specials."

The step of the manufacturers in this connection is taken in conformity with recommendations made by Secretary Hoover to prevent waste in the building industry.

WORKING STRESSES PERMISSIBLE FOR STRUCTURAL TIMBERS OF SELECT (S2) GRADE[1]

(Pounds per square inch)

Species	Bending					Compression					
	Allowable stress in extreme fiber for Select (S2) grade			Allowable horizontal shear stress Select (S2 grade All locations	Allowable modulus of elasticity for all grades All locations	Allowable stress parallel to grain Select Columns[2] for Select (S2) grade			Allowable stress perpendicular to grain for all grades		
	Damp or wet location (docks, piling, and sills)	Outside, not in contact with soil (bridges and open sheds)	Under shelter in dry location (factories and warehouses)			Wet location	Dry outside location	Dry inside location	Wet location	Dry outside location	Dry inside location
Ash, black	800	900	1000	90	1,100,000	600	750	850	150	200	300
Ash, commercial white (green, biltmore, white.	1000	1200	1400	125	1,500,000	900	1000	1100	200	375	500
Aspen and largetooth aspen	600	650	800	80	900,000	450	650	700	100	125	150
Basswood	600	650	800	80	900,000	450	650	700	100	125	150
Beech	1000	1200	1600	125	1,600,000	900	1100	1200	200	375	600
Birch, paper	600	750	900	80	1,000,000	450	550	650	100	150	200
Birch, yellow and sweet	1000	1300	1600	120	1,600,000	900	1100	1200	300	375	500
Cedar, Alaska	800	900	1000	90	1,100,000	650	750	800	150	200	250
Cedar, western red	700	800	900	80	1,000,000	650	700	700	125	150	200
Cedar, northern and southern white	600	650	750	70	800,000	450	500	650	100	140	175
Cedar, Port Orford	900	1000	1100	100	1,200,000	750	825	900	150	200	250
Chestnut	700	850	950	90	1,000,000	600	700	800	150	200	300
Cottonwood, common and black	600	650	800	80	900,000	450	550	700	100	125	150
Cypress, bald	900	1100	1300	100	1,400,000	800	1000	1100	225	250	350
Douglas fir (western Washington and Oregon)[3]	1000	1300	1600	90	1,600,000	850	1000	1100	200	225	325
Douglas fir (Rocky Mountain type)	700	900	1100	85	1,200,000	700	800	800	200	225	275
Elm, cork	1000	1300	1600	125	1,300,000	900	1100	1200	300	375	500
Elm, slippery and white	800	900	1100	100	1,200,000	650	750	800	125	175	250
Fir, balsam	600	700	900	70	1,000,000	500	600	700	100	125	150
Fir, commercial white (white, noble, grand)	800	900	1100	70	1,200,000	650	750	800	150	200	300
Gum, black and cotton	800	900	1100	100	1,200,000	650	750	800	150	200	300
Gum, red	800	900	1100	100	1,200,000	650	750	800	150	200	300
Hemlock, western	900	1100	1300	75	1,400,000	800	900	900	200	225	300
Hemlock, (eastern)	800	900	1000	70	1,100,000	600	700	700	200	225	300
Hickory, (true and pecan)	1200	1500	1900	140	1,800,000	1000	1200	1500	350	400	600
Larch, western	900	1100	1200	100	1,500,000	800	1000	1100	200	275	325
Maple, sugar and black	1000	1300	1600	150	1,600,000	900	1100	1200	300	375	500
Maple, red and silver	700	900	1000	100	1,100,000	600	700	800	200	250	350
Oak, commercial red and white	1000	1200	1400	125	1,500,000	800	900	1000	200	375	500
Pine, southern yellow[3]	1000	1300	1600	110	1,600,000	850	1000	1100	200	225	325
Pine, white, sugar, western white, western yellow	750	800	900	85	1,000,000	650	750	750	125	150	250
Pine, Norway	800	1000	1100	85	1,200,000	700	800	800	150	175	300
Poplar, yellow	800	900	1000	80	1,100,000	600	700	800	125	150	250
Redwood	800	1000	1200	70	1,200,000	750	900	1000	125	150	250
Spruce, red, white, Sitka	800	900	1100	85	1,200,000	650	750	800	125	150	250
Spruce, Engelmann	600	650	750	70	800,000	450	550	600	100	140	[illegible]
Sycamore	800	900	1100	80	1,200,000	650	750	900	150	[illegible]	[illegible]
Tamarack, (eastern)	900	1100	1200	95	1,300,000	800	900	1000	200	[illegible]	[illegible]

[1] Working stresses for Extra Select (S1), Extra Select (S1) Dense, Standard (S3), and Common (S4) grades are obtained by multiplying the basic stress by 7/6, 8/6, 5/6, and 4/6 respectively.

[2] The influence of knots on compressive strength of columns of constant cross section decreases as the length increases. When the length reaches 30 times the least dimension, knots such as are allowable in Select (S2) timbers have no effect on the strength as a column.

[3] The working stresses of any grade of timbers of Douglas fir and southern yellow pine which meet the density requirements of the American Society of Testing Materials shall be increased one-sixth the allowable stress given in the table for the basic or Select (S2) grade.

How Should Factory Structures be Built?

The Portland Cement Association Have Developed a Set of Regulations That are Recommended as a Model for Widespread Adoption With Modifications to Suit Individual Requirements

In the last two issues of the Contract Record excerpts from the "Recommended Building Code" of the Portland Cement Association have been published. In this article are printed from the code the recommendations covering factories, office and mercantile buildings. To municipal officials, structural designers and constructors these sections from the code will be interesting. They are numbered as they appear in the code.

Section 48 Classification

This classification includes all factories and workshops (including all places where manual labor is employed), office buildings, telegraph, and telephone offices, mercantile establishments where commodities are bought or sold, warehouses, railroad stations, exhibition buildings, and places where less than 100 persons assembled for entertainment, worship, or dining purposes.

Section 49 Exits
Number and Location

Every building and every story thereof shall have at least two exits, with the following exceptions:

(1) First and second story storage rooms not over 3,000 square feet in area;

(2) The second storey of a two storey building provided such storey is used only for offices; is not over 3,000 square feet in area; and has a stairway enclosed with fireproof or semi-fireproof partitions, leading directly to the outside and not leading to the basement.

Additional exits shall be provided, if necessary, so that no part of the building will be more than 75 feet distant from an exit, measuring along public passageways and aisles; but such distance may be increased to 100 feet in the following buildings provided no hazardous condition exists therein:

(1) Fireproof buildings whose contents are entirely or almost entirely incombustible;

(2) Fireproof office buildings;

(3) Fireproof storage warehouses with fireproof individual compartments;

(4) Buildings having an approved automatic sprinkler system, provided the contents are not especially inflammable.

Exits shall be so located as to afford the best possible egress.

Type of Exits

At least one-half of the exits above required shall be stairways. The other exits shall be either stairways, or horizontal exits, or fire escapes. But no fire escape shall be accepted as an exit from any floor which is more than 60 feet above the grade at the point where such fire is located, except that such height may be increased to 90 feet in the case of fireproof buildings where such floors are used for storage only. In a two storey building, an outside wooden stairway may be used as an exit.

Every building which accommodates more than 50 persons above the second floor shall have at least two exits other than fire escapes, except fireproof office buildings and other fireproof buildings whose contents are entirely or almost entirely incombustible, provided such building does not exceed 7,000 square feet in floor area at the third floor.

Enclosure of Stairways

In all buildings having a greater number of storeys than the number given in table 1, all stairways shall be enclosed.

Exceptions. (1) A three-storey mercantile building having at least two stairways may have one stairway unenclosed provided such stairway does not lead to the basement.

(2) A fireproof building having at least two stairways may have one stairway unenclosed from the first to the third (or second) floor, provided such stairway is enclosed in the third (or second) storey and does not lead to the basement.

(3) Stairways must be enclosed in all buildings of more than two storeys where inflammable material or any other especially hazardous condition is present.

A fire escape shall be provided on every building of more than two storeys which does not have at least two enclosed stairways, or one enclosed stairway and a horizontal exit.

One enclosed stairway may serve as an exit for two divisions of a building if each division has a door opening directly into the stairway enclosure; provided each division shall have at least two means of reaching the ground, either directly or indirectly.

Total Width

In a building not provided with horizontal exits, the total width of stairways shall be not less than the following:

In ordinary or frame buildings, 60 inches per 100 persons; if sprinklered, 40 inches per 100 persons

In fireproof and mill buildings, as indicated in table 2.

Standard fire escapes may be substituted for stairways to the extent of not more than one-third of the required total width, subject to the provisions of this section, under the heading "Type of Exits."

If horizontal exits are provided for any floor, the number of persons accommodated on such floor may be increased at the rate of 100 persons for each 40 inches width of such exits, provided such increase

Table 1—Enclosure of Stairways

	Stairs to be enclosed if building exceeds No. of storeys		
Type of building	Non-fireproof not sprinklered	Either Fireproof or sprinklered	Fireproof and sprinklered
Office buildings; other buildings whose contents are practically incombustible	3	4	5
All other factories, stores, and other business buildings	2	3	4

Table 2—Width of Stairways

	Type of Building Fireproof, sprinklered	Fireproof, not sprinklered	Mill, sprinklered	Mill, not sprinklered	
Inches per 100 persons on 2nd floor	30	50	40	60	
plus	15	25	20	30	Inches per 100 persons on 3rd floor
plus	12	20	16	24	Inches per 100 persons on 4th floor
plus	9	15	12	18	Inches per 100 persons on 5th floor
plus	6	10	8	12	Inches per 100 persons on 6th floor
plus	3	5	4	6	Inches per 100 persons on 7th floor
plus	0	0	0	0	Inches per 100 persons on 8th floor and above
but in no case shall such total width be less than	30	50	40	60	Inches per 100 persons on any one floor

shall not exceed 100 per cent of the number of persons accommodated by the stairways.

Example. As examples of calculations under this section where the same number of persons are to be accommodated on each floor, the following table shows the number accommodated by two stairways of minimum width (each 44 inches wide):

Frame and ordinary buildings, 147 persons total, above first storey if sprinklered, 220 persons.

Fireproof and mill buildings, as indicated in table 3.

Where one minimum stairway and one "A" fire escape are provided, take ¾ of the above numbers; subject to the limitations of Section 49.

Capacity of Buildings

In calculating the aggregate width of exits, the capacity of a building shall be established as follows:

In wholesale mercantile establishments and warehouses, by the number of persons employed therein plus an equal number of customers.

In dining rooms, cafes, and lunch rooms, by allowing 15 square feet of floor per person. (If the room accommodates more than 100 persons see Section 58).

In retail mercantile establishments and exhibition halls, the capacity shall be determined by the architect or owner and no greater number of persons shall be permitted therein; but such number shall in no case be less than one person per 60 square feet of gross floor area excluding elevators and stairways.

In all other buildings, the capacity shall be determined by the actual number of persons likely to be engaged therein and no greater number of persons shall be permitted therein. (See Section 57).

Exit Doors

Every door which serves as an exit from a room accommodating more than ten persons (as well as doors which are exits from public passageways or stairways) shall be a standard exit door except that such exit doors need not swing outward if it accommodates less than 25 persons and is not located at the foot of a stairway, and is not more than four risers above the outside grade. Over every emergency exit door, and over every exit door where other doors or openings may cause confusion, a sign shall be placed bearing the word "Exit" or "Out" in plain letters at least 5 inches high.

Passageways

Evey public passageway or aisle leading to or from a stairway, fire escape, or exit door, shall conform in width to the rule for width of stairways specified in this section. The required width shall be kept clear and unobstructed at all times. Where loose chairs or seats would be likely to cause confusion of obstruction, such chairs or seats must be fastened.

Section 50. Scuttle

Every building or section of a building two storeys or more in height shall have a permanent means of access to the roof from the inside. The opening shall be not less than 20 by 30 inches and there shall be a permanent ladder or stairway leading thereto.

Section 51. Elevator Enclosures

Elevator enclosures shall be designed and built in accordance with Section 19, under paragraph entitled "Standard Fireproof Enclosure or Partition."

Section 52. Trap Doors and Floor Openings

Every opening through any floor shall be guarded by a substantial enclosure or rail at least 3 feet high. Floor openings in buildings of more than two storeys, unless enclosed with standard fireproof enclosures, shall be protected by standard fire doors, except that two storeys may be connected by openings without fire doors if their combined floor area does not exceed the permissible floor area according to Section 28.

Section 53. Lighting

All passageways and stairways when used at night shall have lights at the head and foot of each flight of stairs, and at the intersections of all corridors and passageways. Where "B" fire escapes are required, such fire escapes shall be lighted whenever the stairways are required to be lighted.

All gas jets or gas lights in factories or workshops where combustible material is used, shall be properly enclosed by globes or wire cages, or otherwise properly guarded.

Section 54. Toilet Rooms, Lavatories and Dressing Rooms

Number of Closets and Urinals

In every place of employment, whether heretofore or hereafter constructed, one water-closet shall be

Table 3—Number of Persons Accommodated by Two Stairways

Height of building	Type of Building Fireproof, sprinklered	Fireproof, not sprinklered	Mill sprinklered	Mill, not sprinklered	
2 storeys	293	175	220	147	Persons on each floor
3 storeys	195	117	147	98	Persons on each floor
4 storeys	154	92	116	77	Persons on each floor
5 storeys	133	80	100	67	Persons on each floor
6 storeys	122	73	92	61	Persons on each floor
More than 6 storeys	117	70	...	...	Persons on each floor

provided for every 20 persons, or fraction thereof, of either sex.

In addition thereto, where more than 10 males are employed, one urinal shall be provided for every 40 males, or fraction. Where not more than 10 males are employed, either a urinal shall be provided or the water-closet shall have a projecting lip and self-rising seat. Where trough urinals are used, each two feet of trough shall constitute one urinal.

Toilet Room Lavatories

Adequate washing facilities shall be provided in or near every toilet room. In new installations there shall be at least one lavatory for every five fixtures (closets and urinals) or fraction.

Shop Lavatories

Adequate washing facilities shall be provided (1) in all industries where lead arsenic, or other poisonous or injurious materials are handled by the employees, and (2) in industries where food is prepared or manufactured, and (3) in glue factories, foundries, machine shops and other industries where the employees' hands become dirty or greasy. In new installations there shall be at least one lavatory for every ten employees, or fraction, and hot water shall be provided. Basins or troughs for common use are prohibited.

All lavatories must be made of porcelain, enameled iron, or other impervious material.

Drinking Water

Each place of employment must be supplied with sufficient pure drinking water and the faucets or outlets for same must be placed convenient to the employees. Common drinking cups are prohibited. Sanitary drinking fountains must be installed or individual cups must be provided by the employer.

Dressing Rooms

Dressing rooms shall be provided where women are employed in factories, stores, laundries, restaurants, and telephone, telegraph, express and railroad offices. Every dressing room shall be properly lighted, ventilated, and heated.

Section 55. Standpipes, Fire Extinguishers and Sprinklers

Standpipes and Extinguishers

Standard interior standpipes shall be provided in all buildings of more than two storeys and more than 3,000 square feet undivided floor area, where inflammable material or any other hazardous condition is present, unless an approved automatic sprinkler system is provided. The hose shall be long enough to reach to all parts of the building, but no longer than 100 feet.

Wherever water supply of sufficient pressure is not available, two standard fire extinguishers shall be provided on each floor in place of each required interior standpipe.

Automatic Sprinklers

A complete automatic sprinkler system shall be provided in every building of this classification (except office buildings not used for mercantile purposes) where more than 50 persons are employed or accommodated above the third storey except as provided below.

In every such building where more than 50 persons are accommodated above the second storey, an automatic sprinkler system shall be provided in the basement and sub-basements.

An office building in which one or more of the lower floors is used for mercantile purposes, shall be classed as a mercantile building, except that no sprinklers will be required in such portions of the building as are used for offices only.

No sprinklers will be required in a building of fireproof construction whose contents are not readily combustible.

Section 56. Fire Alarm

An approved fire alarm system shall be provided in every factory or workshop where more than 10 persons are employed above the second storey, except buildings which are provided with a complete automatic sprinkler system, and except fireproof buildings whose contents are practically incombustible.

Section 57. Notice of Loads and Persons Accommodated

Floor Loads

In every factory, workshop, warehouse, or other building where material is piled, notices of a permanent character shall be painted or otherwise prominently displayed, stating the live load (pounds per square foot which the floor is designed to carry. Such notices shall be placed in full view, on each floor.

Number of Persons

In all buildings of this classification where 50 or more persons are accommodated on any floor above the second, notices shall be prominently displayed stating the maximum number of persons on each floor for whom stairways and other exits have been provided according to Section 49. Such notices shall be placed in full view, on each floor.

The Guarantee of Success in Highway Administration

The obligation of the provincial state highway department is not fulfilled merely by selling ideas, for before it can sell anything it has to, like any other business enterprise, have the healthy respect of the people for both its purposes, its judgment and its work. If the people are lead to believe that its purposes are political, that its judgment is biased and its work is poorly handled and wastefully done, it can't sell ideas. Therefore, when the general policy of a live department is decided upon, after definite and long continued conferences with the people and with the interdepartmental divisions, let the people know —don't hide it. Expenditures are large, tens of millions of dollars yearly in some cases, and the making available of funds in future years will be one of the jealous prerogatives of future legislatures. Highway programs always will depend upon the legislatures as representing the will of the people; therefore, public opinion should be courted. Much has ben said of decentralized control as against centralized control. If the public are informed by impartial observers who know the work that the department is a real going concern, if they appreciate that there is a definite policy, close financial control, rigid construction standards, real teamwork in the organization, then they can appreciate that the selling arguments are sound. The concomitants that go with this definite appeal to the public, however, are sound engineering skill in maintenance and construction, and real business contract co-operation with the contractors who accept the provinces or state's business.—H. E. Hilts, acting state highway engineer of Pennsylvania.

For the Building Supply Dealer

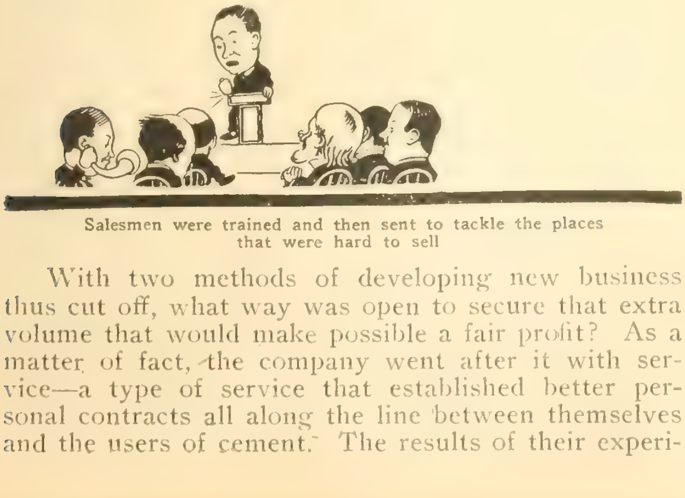
A Service Idea That Increased Cement Sales

How One Manufacturer, by Working With the Dealer, Established Better Personal Contacts With the Users of Cement

Competition of the keenest kind frequently characterizes the cement producing business. It is competition of a type that often makes it impossible to make more than extremely small profits even though a large volume of the commodity is produced and sold. Ten years ago a situation of just that sort—large turnover but an inadequate margin of profit and a net loss in some territories—existed in one particular company, whose story we write in this article. A part of their eastern business had been dropped because of stiff competition, while in the middle west—which seemingly offered an excellent market—there sprang up the same keen competition which was made all the more severe by reason of the heavy freight charges on cement shipped over any distance. Ten years ago, then they were confronted with a large volume of business that was becoming less and less profitable and at the same time they had a large mill capacity which had to be cared for. How to maintain their large volume of business, or anything like it, and get a reasonable profit on it, was the question.

The plan the company evolved—after clipping off the unprofitable fringes of their market outside the territories directly served by their mills—was to do something to give them their full share of the going business in their legitimate territory and at the same time, as far as possible, create new business and new uses of cement.

By reason of the nature of cement, two common and excellent methods of going after new business were closed to the company of whom we write. No special inducements in the way of quality could be offered because portland cement is a thoroughly standardized commodity, adhering to very strict specifications. In anything better, customers are not greatly interested. Furthermore, because portland cement is so highly standardized, there was no possibility of a special appeal in the way of price.



Salesmen were trained and then sent to tackle the places that were hard to sell

With two methods of developing new business thus cut off, what way was open to secure that extra volume that would make possible a fair profit? As a matter of fact, the company went after it with service—a type of service that established better personal contracts all along the line between themselves and the users of cement. The results of their experiment have more than justified their efforts and today they are doing a class of profitable business that owes its whole success to their development of this service idea.

Working With The Dealer

Their service plan began with their handling of dealers. In the first place they saw that any intelligent policy means selling for the dealer as well as to him and so they proceeded to make their salesmen strong, virile points of contact between themselves and their dealers. They made sure that their dealings with their dealers were more than the mere order-taking that they had been before. Under the new plan they determined to do more than just sell a little cement to dealers here and there; they wanted to see that the cement reached the dealer promptly and then was moved readily from his warehouse to the consumer.

To accomplish this plan, this firm of producers first of all required more salesmen and better control of them. For example, the staff of four men handling the territory out of one large centre was increased to seventeen, each living in his territory so as to acquire the point of view of the dealers and the dealers' customers and see better how they could be served. Indeed, the whole sales department was reorganized so as to develop stronger contacts between the salesmen and the dealers.

The dealer had to do some tall hustling to keep up with the market that was developed

As soon as they got salesmen trained they tackled the places that were hard to sell. They began to see that these places might be, that indeed they were, of greater importance than any others and they passed this view right along to the salesmen. If there was a town where they had given up trying to get a dealer they would concentrate on it. Salesmen would set out to make such a demand for cement that the opportunity of becoming a dealer in the town would be irresistible— and irresistible to the right sort of man. In one town, for example, one salesman painstakingly got up a list of the people who were most likely to be interested in concrete and circularized them telling them of specific uses of cement that seemed suited to their needs. He encouraged inquiries regarding the uses of cement, many of which developed into sizable orders. With these in his hand, he had the choice of available dealers and the town immediately became a good market for the company. In some cases it was necessary for the salesman to seek out new dealers because the ones they had were not the right sort, but generally speaking, the firm's policy was to work on the dealers already on the ground, knowing that their experience and acquaintance were too valuable to sacrifice. With these men the service idea was developed to the utmost.

Take the matter of storage, for instance. With a heavy commodity that is spoiled if it gets wet, proper storage is of prime importance. It may easily be the determining factor in the dealer's profits, but very frequently the dealer has neither time nor facilities for working out his cement storage problems in the very best possible way. It was realized that the manufacturer could be of some help to him on that question and so this company had their engineers design a model warehouse, which they discussed with the dealers. They did not impose the design on the dealer but adapted the principles of it to individual requirements as rapidly as the dealers were ready to undertake new construction or changes in buildings they already had. This work not only meant earnings and more profits to the dealers but made them like to handle cement better and therefore push its sales in preference to other materials.

The auditing department was also able to render an important service to dealers by giving them advice on bookkeeping matters. Dealers in the building supply business have a big problem in their bookkeeping and they are prepared to be very grateful to anyone who will help them work out their individual accounting problems. In the theory of accounting, dealers cannot be much interested but in the practical side of it they undoubtedly are and in that phase of the work members of the auditing department of this company have been of valuable assistance. Frequently they have gone out and worked personally with the dealers.

In all this work the salesmen have been very necessary and very able co-operators. Their task, as a rule, has been to bring things to the point where the engineering or auditing department could render its service. In many instances they have done more and have actually helped the dealer to arrange his warehouse or have sat in on his books in his busy season.

Sometimes they have to develop special ideas of service to build up business. For example, in attempting to determine why sales in one territory failed to show what seemed to be a reasonable increase an investigator was sent, who hit on three dealers well distributed over the territory, who were willing to try working out improvements in their methods. With each of the three, a service scheme was worked out, that was remarkably successful.

The salesman went with the dealer to the local newspaper and got the names of the subscribers to whom the dealer was induced to send out a series of circulars on cement and its uses, the salesman helping him to prepare these. Until he had talked this scheme over with these dealers they had thought that circularizing of this sort was beyond them, but they soon saw how practicable the idea was. The newspaper proprietor was glad to co-operate because as a by-product of the circularization campaign he got advertising from this and other dealers. When the results began to show, the salesman rendered further assistance by handling some individual sales that required perhaps more initiative than the dealer was used to exercising. All of this work, of course, required tact but in every case, the greatest harmony prevailed and large increases in sales resulted.

The scheme and the effects of it impressed other salesmen and as a result a large business was built up among the dealers who had been just ordinary or less than ordinary customers.

These are some of the methods by which a profitable business has been developed for this particular firm. They are selling methods, of course, but they represent the working out of that single idea of service. The company aimed to stop at nothing that was real service and they believe that they have proven that service is what counts in any kind of real selling. Too many building material manufacturers—certainly too many cement producers—do not develop the dealer trade with any real idea of service in mind, but this firm has found that a little service goes a long way in producing profitable business. In other lines the lessons they have learned could be profitably taken to heart and we are sure that any efforts spent on developing service would be more than justified by the results.

Frank Gillis Wants an Association of Building Supply Dealers

Halifax, Aug. 20, 1923.

Editor, "Contract Record":

We are very glad to learn that you are opening a department in connection with builders' supplies in the Contract Record. One of the first things that should be done, we believe, is the establishing of a builders' supply association, similar to the one in the United States, as at the present time the different building supply houses are not very close to one another. On the other side of the border they have a very live and active association, through which the dealers have been able to obtain 100 per cent cooperation from the manufacturers, a condition that does not by any means apply in Canada.

Frank A. Gillis,
President, Frank A. Gillis Co., Ltd.

How the Supply Salesman Can Build up Goodwill

"I'm glad to see that big stock-pile out in the yard," observed the Supply Salesman, as he eased himself into a chair beside the Manager's desk. "You evidently thought enough of my advice to take it, didn't you?"

"Yes, that was once you had the right hunch," admitted the Manager.

"Thanks; just for that, here's another that I won't charge you for. You are not getting as much good out of your cement as you might," the Salesman calmly stated.

"Is that so?" bristled the Manager. "Suppose you tell me why."

"How do you know you're using an economical mix? Are you sure you're getting the most good block possible with a sack of cement?"

"Why, I guess we are," returned the Manager.

"You guess you are? Why don't you know? You're over-looking a good bet. Let's see some tests on your block," challenged the Salesman.

"Haven't any tests," the Manager had to admit.

"There you are!" exulted the Salesman "No tests! How do you know your block are any good at all?"

"What I want to tell you," he went on, "will put money in your pocket. Locate a testing machine, slip a few of your blocks into it, and see what they'll do. Tests tell you all about the block you're making. They are the only measures of quality. Suppose the results of the tests are good, and you've got 'em all down in black and white—then you can go to your prospects and say, 'See here—this is the kind of block you're buying—took 60 tons to smash one block. Why, you can put a Pullman car on one of these blocks and it won't break. That's the kind of block this is.' And that's the kind of talk that'll sell block."

"But we've been making and selling these block for years and never had any kick," objected the Manager.

"That doesn't tell you much about your block, though" insisted the Salesman. "Now just put yourself in the buyer's place—wouldn't he feel better about your block if you could out-and-out guarantee 'em? Sure, he would; have some reliable tests made; talk tests; and tests will back your guarantee."

"You make it sound like a good thing," the Manager acknowledged; "I'll try it. If it makes that stockpile shrink, all right; if it doesn't— your best alibi won't save you!"—From Concrete House Magazine.

How Can I Increase My Sales?

Attractive Letterheads Bring Business

Inasmuch as letter writing forms one of the most important parts of the business of the supply dealer (as of any other business) it seems to me that it is one of the first duties of a building supply dealer to make his letterheads attractive. Our own experience, as well as that of many others in the same line, has proven that the business letterhead can be made an excellent business-getter. Just recall the letters that you have received from business houses. Have not some of them been so striking as to remain in your mind and unconsciously induce you to put business in the way of those firms when the time came for you to place orders? On the other hand, have not some letterheads been somewhat repellant and given you a bad impression of the firm and its products? It is true of the building supply business and if dealers were only wide enough awake to see the importance of neat and striking letterheads they would vastly increase their sales. The letterhead should not have anything harsh or repellant about it, but something that will cause the reader of the letter to retain in mind the firm name at the top of the letter and persuade him to do business with that firm. Our experience is that a little thought spent in getting out suitable business stationery will be well repaid.—Wm. C. L.

Striking Calendars Keep Firm in Mind

At the end of each year we spend considerable money getting out imposing calendars for the coming year and distributing these to our customers and prospects. We do not go in for the rather prosaic and unartistic calendars that are so often issued by business firms. Rather do we prefer to spend extra money in getting out a calendar that we feel will be kept in the office of our customer instead of thrown in the waste paper basket. An artistic picture, good printing, and heavy paper all make for a calendar that will attract attention. Of course, we see that our name is prominently brought out, but not so strongly as to spoil the effect of the picture. Enquiry has substantiated our feeling that such calendars are kept constantly hung up in a prominent place on the office wall, thereby serving to keep our name constantly before people with whom we wish to do business. This doesn't sound like much of a business-getting stunt, but if building supply dealers are going to spend money in distributing calenders, they might as well get the most value they can out of their expenditure. —L. C. O'D.

Tenders on Brandon Hospital

The following tenders were received in connection with the new hospital for mental diseases at Brandon, Man.:

Plumbing

Bower Boag, Limited, Winnipeg (accepted)	$26,011.00
Cotter Bros., Ltd.	29,805.00
Yates, Neal & Co.	32,900.00
Chas. D. Kirk & Co.	29,000.00
James Mackie	21,232.00
Forbes & Christie	31,795.00

Ventilation

Western Cornice & Rfg. Co., Winnipeg (accepted)	3,070.00
Can. Rogers S. M. Co.	3,490.00
J. D. MacDonald	3,695.00
Central S. M. Works	6 816.00

Temperature Control

Johnson Temperature Control Co. (accepted)	9,764.00

Heating

	Labor	Radiation
Yates, Neal & Co., Brandon, Man. (accepted)	$5,711.00	$6,698.00
Cotter Bros. Ltd.	5,972.00	7.256.00
Chas. D. Kirk & Co.	8,100.00	6,900.00
James Mackie	8,300.00	7,450.00
Bowyer Boag Ltd.	7,056.00	7,293.00
Crane Limited	....	6,873.09
Pease Western Foundry Limited	....	7,084.59
Dom. Radiator Co.	....	6,874.59
Forbes & Christie	7,720.00	8,010.00
J. Ballantyne Co., Ltd.	7,200.00	6,900.00

New Era for Highway Engineers

"The present highway engineers are entering in a new field of endeavor," recently said H. E. Hilts, acting state highway engineer of Pennsylvania. "They are not following out rule of thumb methods of guessing at this or that, but slowly they are attempting to evolve logical engineering designs to fit the needs of the loads which are or may become legal, and therefore used. The bold designs of the past are being replaced by conservative standards which in the future will bear the light of increasing scrutiny. More and more as the light of truth creeps into the field of highway engineering, the failures of the past will be shown up in their true light as failures not so much of engineering as of the system under which roads have been built; the system which on the one hand calls for extended mileages of secondary types, and on the other for short mileages of wide suburban thoroughfares. It is true that some engineers still live in the memories of the past; they think in terms of 1910."

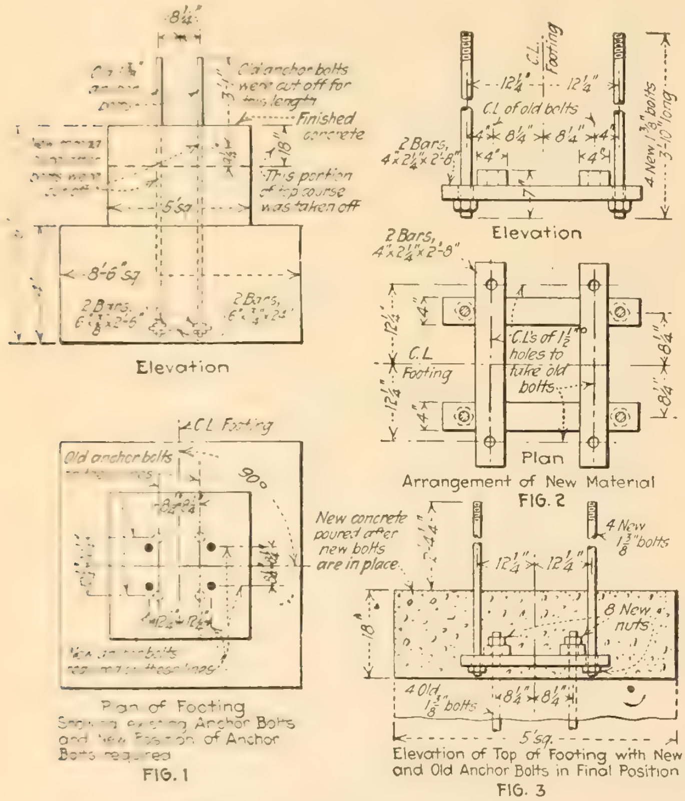
The Canadian National Exhibition is now in its forty-fifth year. It started in 1879 but really dates back to 1846, when the Association of Ontario Arts and Agriculture was formed, an institution that had its start with the first fair in Canada, established at Niagara in 1793 when the future settlers decided to grow flax for the purpose of furnishing the raw material for the canvas that provided the motive power for the British Navy and Mercantile of that day.

Hints for the Contractor

Placing New Column Foundation Anchor Bolts While Using Existing Ones

In one of the column foundations which had been built for the viaduct portion of the Hill-to-Hill Bridge at Bethlehem, Pa., it was found necessary to revise the position of the anchor bolts so that the axes of the bolts in the new position would be 90 deg. with those of the existing bolts. The latter were embedded practically the full depth of the concrete footing and were held together at the bottom by four anchor plates in accordance with the design as shown in Fig. 1.

The method of providing new anchor bolts, described in Engineering News-Record, was devised under the desideratum that the new anchorage must be as positive as the one designed originally, in its ability to resist uplift. Fig. 1 shows the plan and elevation of the existing foundation and its anchor bolts.



Plan of Footing Showing existing Anchor Bolts and New Position of Anchor Bolts required
FIG. 1

Arrangement of New Material
FIG. 2

Elevation of Top of Footing with New and Old Anchor Bolts in Final Position
FIG. 3

Method of placing new anchor bolts

Eighteen inches of the top course of the footing were taken off by means of air drills and feather wedging and the exposed surface levelled by hand chiseling. The four existing bolts were then cut off about 9 in. above this surface and the ends rethreaded. Four new 1⅜-in. bolts with four steel bars, 4 in. x 2¼ in. x 2 ft. 8 in. long, assembled as shown in Fig. 2, were then slipped over the old bolts. The size of these steel bars was determined from the following conditions:

1—Two of the bolts on any one side of the footing were considered under a tension equal to the safe tensile strength of the bolts.

2—The moments developed in the bars by the above assumed forces acting on the bolts were then computed and the bars designed to carry these moments.

The new bolts were next set to the correct elevation, nuts were placed on the old bolts and turned to a bearing on the upper surface of the top 2¼-in. bars. The final assembly of the old and new anchor bolts is shown in Fig. 3. Concrete was then poured to complete the top course of the footing to the finished elevation required for seating the steel column.

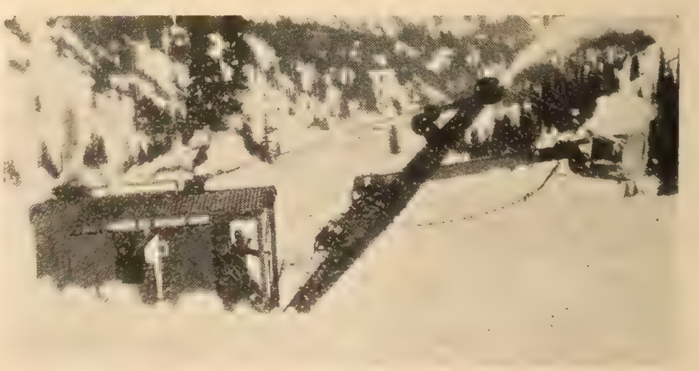
Cutting Concrete Piles with Dynamite

In building a reinforced-concrete wharf at the Pearl Harbor Naval Station, Hawaii, penetration of concrete piling was such that in many cases the refusal point was reached as much as 7 ft. above the desired grade. Lieut-Commander S. Gordon, Civil Engineer Corps, U. S. Navy, devised a system of dynamiting the piles, says a recent issue of Explosives Engineer, which was an adaptation of means previously used on wooden piles.

After exploding a stick of 60 per cent dynamite in a 1-inch horizontal hole cored at the butt of a test pile, the shattered concrete was cut away, the surface smoothed with carborundum, tests for cleaveage made on the concrete with magnifying glass and hammer, and the reinforcing bars subjected to bending tests. As both concrete and rods were found undamaged, holes were then cored around the butts of the remaining piles which were shot in batteries of eight. In no case did the disruptive damage extend farther than 18 in. from the center of the charge.

Steam Shovels Remove Snow from Roads

The demands of the motor tourist are many and for this reason improved national highways have been and are being built into almost inaccessible places. The steam shovel plays a most important part in the initial construction of these highways as well as in subsequent maintenance; but a new and novel use for them has been found in the early spring



Road being cleared of snow by means of a steam shovel season—that of clearing the highways of snow and opening them to traffic often weeks earlier than would be the case if nature ruled.

The Snoqualmie Pass through the Cascades, and the Narada Falls-Paradise Valley Branch of the motor road in Rainier National Park, Washington, were opened by steam shovels this season. Early in May, tourists were travelling from Narada Falls into Paradise Valley by foot and on horseback over the one and one-half mile mountain trail for trips to the glaciers on the slopes of Mount Rainier. The road from Narada Falls to Paradise Inn is six miles long and this road was blocked to traffic by tons of snow. But such difficulties as snow blocked roads were not long to stand in the way with a steam shovel on the job. The shovel, an Osgood 3/4-yd. on continuous treads, cut through seven feet of snow on the road, opening it for traffic much earlier than usual.

Track Mower Produced from Farm Implement

Two 36 in. wheels, an ordinary standard farm mowing machine and a little ingenuity on the part of J. T. McIntosh, general superintendent, and W. E. McLaughlin, master mechanic of the Chicago & Interurban Traction Co., operating a line from Chicago to Kankakee, has solved the problem of weed cutting on this busy suburban and interurban road.

The mower was first modified by lengthening the axle a sufficient amount to carry out the wheels to fit standard gauge of 4 ft. 8½ in. This was done with a sleeve arrangement. Two 36 in car wheels were subjected to the action of a cutting torch. The centre of both wheels were then cut out, a hole 12 in. in diameter being made, and all the metal removed. The hubs of the mower wheels were inserted in these holes, the outer face of the mower wheels abutting the inside face of the car wheels.

Bolt holes were then burned through the car wheel to accommodate hook bolts for each of the spokes of the mower wheels. The hook bolts fit around the spokes and are tightened by nuts against the outer face of the car wheels, thus securely holding the mower wheels against the car wheels in proper concentric position. The use of the 36 in. wheels gives about 1½ in. clearance for the mower wheels above crossing plank. In order to cover the hole at the wheel centre a disc of sheet iron was put on the mower axle.

At the proper place to one side of the mower shoe, was attached a plate metal shoe to ride the rail.

Other than to lengthen the mower axle and attach the shoe, no changes were necessary in the standard mower.

A pivot attachment is used to couple the mower to the car. A line car is used to pull the mower and a special of centre coupler is supplied to fit the off centre pull of the mower.

The utilization of a standard mower with only two changes and the using of two old car wheels makes a very economical assembly for weed cutting. The whole outlay including labor for this equipment did not exceed over $100.—From "Traction Junior" for July.

Machinery & Equipment

A New ¾ Yard Gasoline Shovel

A new ¾-yard gasoline, rope-thrust revolving shovel, known as the 20-B, has just been announced by the Bucyrus Company, South Milwaukee, Wisconsin.

This shovel contains the same unique features which are embodied in their 30-B gasoline machine which has been on the market for the past year.

Like the 30-B, the feature which makes this machine unique among shovels of this type is the ingenious rope-thrust arrangement, patents on which are held by the Bucyrus Company, which not only does away with the necessity of engines, gears, clutches, chains or complicated shafting on the boom, but at the same time gives this shovel a drive behind the thrust more powerful than it is possible to obtain with a steam shovel of the same size, since the whole power of the main engine is behind it. This device has proved itself on the 30-B shovel under the toughest digging conditions.

Briefly stated, the shovel is driven by a single, rugged, slow-speed gasoline engine. The motions of the dipper handle are controlled by a small drum on a shaft under the boom, which shaft has keyed to it pinions for engaging with the racks on the handle. The drum is turned either way by two ropes wound around this drum in opposite directions, both ropes leading to drums in the main machinery.

The striking fact about the performance of this

The Bucyrus 20-B gasoline shovel and dragline shovel is the ease with which the operator can control the motions of the dipper, even to shake it to relieve it of sticky material.

This shovel may also be had with high lift or extra high lift booms, or with dragline, clamshell excavator or crane attachments.

The control is exceedingly simple, and the machinery arranged with convenience of the operator in mind. Whatever clutches are necessary are sufficiently large to obviate the danger of burning. The caterpillars and frame in general are the same as the 20-B steam machine, which is well known for its unusual strength and ruggedness.

An illustrated bulletin describing this new machine may be obtained by writing the Bucyrus Company, South Milwaukee, Wisconsin, and asking for Bulletin F-201-D.

Design of Railway Terminal Stations

The Essential Considerations Concerned in Efficient Station Layout—Anticipation of Electrification—Co-ordination of Long and Short Haul Traffic

By ALFRED FELLHEIMER
Consulting Architect and Engineer, New York

(Continued from last issue)

After the plan has been proven to be in accord with the preceding requirements, determination must be made of certain characteristic basic types, as follows: (A) Through or stub type of track facilities, as affecting train operation, and (B) Head-house type of station facilities, as affecting station operation.

The designation "terminal" while strictly applying to a rail or operating "terminus" only, is, in this paper, used as referring to a station of either the stub or through type of track facilities.

Through Type.—This layout, where the track facilities provide in part or whole for through train operation, is concededly best adapted for efficient and rapid train handling, and is therefore, where choice can be made, the type to be selected unless a careful investigation of all the elements affecting the correlated and dependent facilities, fails to disclose the necessary preponderance of factors in its favor.

Stub Type.—This type, where the train operation terminates at the station, can, where the conditions permit, be given some of the special advantages of the through type by providing a loop or engine release arrangement.

In the stub type of terminal, except in cases where there is a difference between street and track level, the platforms and other facilities can be arranged at one level. This results in advantages as follows:

Highest total efficiency in operation and the greatest convenience to the public.

Freer and faster travel on platforms, unencumbered by stairs or ramps.

Practical elimination of vertical travel of passengers between streets and platforms.

Economy in construction cost, maintenance and operation.

The short haul (suburban) traffic with its intensive service requirements should, wherever possible, be provided with means for through or continuous train operation.

A definite selection must be made of one of the three general types of head-house before proceeding with the consideration of the arrangements of the detail features.

Waiting Room Type of Head-House.—Where the waiting room is made the focal center of the station, with all dependent facilities such as ticket office, baggage and check rooms opening directly therefrom and with separate passenger concourse for access to train platforms. The Washington Union Station is an example. (This arrangement tends to make the main waiting room a thoroughfare between the street and the trains.)

Concourse Type of Head-House.—Where a large general passenger concourse is provided for the mass movement of passengers, with ticket office and other dependent facilities opening directly therefrom, the waiting room with its auxiliary facilities being placed adjacent to but separate from the concourse. The Grand Central Terminal, New York City, is an example. (This type tends to minimize conflict of foot passenger traffic.)

Composite Type of Head-House.—Where a large room is provided exclusively for the sale of tickets, checking baggage and like dependencies, with separate waiting rooms and passenger concourse. The Pennsylvania Station, New York City, is an example. (This type tends to create cross-currents of travel between the various station facilities.)

ELABORATION OF THE DESIGN

Traffic Considerations

Extreme Peak Conditions of Traffic Not to Govern.—While station facilities should be planned to accommodate anticipated traffic, including normal frequently recurring peaks, it is not essential to provide for occasional extreme peak conditions, since, in a well planned station, an overload can be carried by all facilities for short periods without undue operating stress or inconvenience to the public.

Foot Traffic Channels—Natural and Direct.—The general arrangement should invite movement of foot traffic along natural and direct channels so that passengers may, so far as practicable, avoid crossing the main travel routes and the retracing of steps.

Where established lines of city foot traffic are permanently interrupted by the terminal construction, provision should be made to accommodate this traffic without interfering with the normal use of the station.

Separation of Suburban and Through Foot Traffic.—The separation of suburban and through traffic should be effectively accomplished in order to avoid confusion and expedite the movement of both classes of traffic. It is not essential that entirely separate concourse, waiting room and general facilities be provided. It is necessary, however, that the main channels of circulation be completely separated.

Separation of Inbound and Outbound Traffic.—While it is desirable to separate the passenger foot traffic channels and allocate sections of the terminal facilities to inbound and outbound traffic, no physical division should be planned in the track layout that will limit interchangeability and elasticity.

The baggage facilities for receiving, delivery and storage should be separated. Trucking subways, bridges and other passageways may be used in common.

Adequate provision should be made for the public and private vehicular traffic in suitable relationship to station facilities.

In addition to acess to streets, convenient entrances and exits should be provided for interchange of passengers with surface car lines or other local transportation systems.

The plan should provide for direct contact with all natural points of entrance and exit rather than force the diversion of traffic to points dictated purely by the necessities of the architectural composition.

Provision should be made for direct traffic contact facilities, with the passenger platforms.

Where this traffic is in solid trains, consideration should be given to its location outside the terminal.

Segregation of Freight Traffic.—Where the terminal plan includes provision for freight traffic, this portion of the layout should be entirely segregated from the passenger facilities and, as far as possible, all freight driveways should be separate from the main streets or thoroughfares, in order to minimize the interference in the operation of these facilities with passenger and public traffic.

Station Facilities

General Requirements.—The various facilities comprising the station proper must be placed in the natural and orderly grouping which their logical related uses dictate. The individual sizes of adjacent facilities should permit modification, if future requirements so dictate, without seriously disarranging the general co-ordination of the plan.

The Passenger Concourse.—This should be roomy and entirely enclosed with weather-tight gates at the train platforms. These train gates should preferably be in a continuous line on one side of the concourse. The concourse should be free from confusing changes in direction; ample and direct access should be provided from the concourse to strategic street points and the various station facilities.

The Waiting Room.—These should be arranged to be conveniently accessible for patrons from the street and station facilities without inviting usage as a thoroughfare, with all facilities for the comfort and accommodation of waiting passengers located adjacent and readily accessible. The location should permit of adequate ventilation and daylighting.

The Ticket Office and Checking Facilities.—These should be placed in contact with, but not encroaching upon the main routes of travel between streets and trains, so that persons not requiring these facilities may pass without conflict with passengers buying tickets or checking baggage.

All working facilities should be provided with conveniences and equipment required to insure the full working efficiency and comfort of the employes.

Concessions.—Revenue producing facilities conducive to the comfort and convenience of the passengers should be located along the main arteries of travel, placed so as not to reduce the effectiveness of station operation. Their arrangement should insure maximum patronage from the general public and railroad patrons, thereby enhancing their rental value.

Architectural Objective of the Design.—The elaboration of the architectural features of the design should reasonably express the purpose of the improvement and emphasize the relative importance of entrances, exits and like features. Attention should be paid to mass effect which attracts the notice of the general public rather than to details which are seen or appreciated only by a few. Economical consideration should be a definite aim throughout including the avoidance of especially elaborate constructional detail.

The station plan should impose on the office building no limitations which will exclude any essentials needed to assure successful competition with similar commercial buildings.

Where the character of overhead buildings can be predetermined, as requiring contact with the station, freight or other facilities, it should be provided for; otherwise, flexibility should be given, making possible future conversion to suit the requirements.

Platforms and Ramps

Platforms.—These should be level with the car floor, especially for suburban service. If conditions compel the use of low platforms, provision should be made for future conversion to the high type.

Where the width of platform is restricted by the need for intensive development of the property, the minimum should permit passengers to pass freely between loaded baggage trucks when placed along either side of the platform.

Means should be provided to avoid trucking across platforms and tracks.

Baggage elevators should not be located in narrow platforms except at the outer end. When placed at the concourse end they should not obstruct circulation. The enlargement of platforms at the concourse end known as the "midway" provides space for the location of elevators, stairs and similar facilities without encroachment upon the concourse or interference with public circulation, and permits the use of several train gates at one time in speeding the exit of arriving passengers.

Separate baggage platforms are not ordinarily necessary. The handling of baggage on passenger platforms causes slight interference with passenger traffic. Suburban trains carry practically no baggage. Inbound long-distance trains normally occupy the platforms for a considerable period beyond the short interval required to discharge the passengers. Passengers for outbound long-distance trains are so thinly distributed that no appreciable interference results. However, if such platforms are provided at all, they should be ample width, as narrow ones will be useless.

The spacing of platforms and tracks, particularly if lines of columns are necessary, should be designed to permit ready rearrangement of platform widths to meet future needs.

Column lines for superimposed structures in the absence of controlling conditions to the contrary, should be located in the platforms instead of between tracks thereby reducing danger to overhead structures, increasing the view for operation, adding to safety and facilitating maintenance. Columns in platforms interfere but slightly with passenger movetunity, with small loss of space, whereas, when between tracks, the space is entirely lost.

Ramps.—Where the tracks and streets are necessarily at different levels, the vertical travel, if possible, should be by means of ramps, rather than by stairways.

In general, ramps permit more rapid circulation, cause less fatigue and minimize accidents.

Where the foot of ramp extends several car lengths or more from the station end of a narrow platform, provision should be made to avoid backward travel of arriving passengers.

Track Facilities.—A reasonable proportion only of the station tracks need be of sufficient length to accommodate the longest trains that present power can handle, plus an allowance for increase.

Excessive rates of curvature and grades should be avoided as interfering with effective and safe operation; and tracks along platforms, especially of the high type, should as far as possible, be straight.

Where overhead building construction is contemplated, the track spacing and location of special work should afford reasonably free opportunity for placing of columns and avoidance of long building spans.

Where conversion from steam to electric power in the future is a possibility, provision should be made to permit the installation of electrical features affecting the track and platforms.

Special Structural Requirements.—In addition to the usual provisions for changes due to temperature, all buildings whose rental value or use is adversely affected by excessive vibration should, as to their foundations and other structural parts, be entirely separated from similar parts in other buildings or structures through which directly or indirectly the vibration due to rolling or live load may be transmitted.

Columns at track level where necessary should be protected by suitable collision piers to prevent failure through derailment, and should never be located in the direct line of the track immediately beyond a bumping post.

The choice of type of future electrification, if initial operation is by steam, should not be hampered by any structural limitations, such as insufficient headroom.

Auxiliary Facilities.—Provision should be made for the location of all auxiliary operating facilities such as signaling, central plants, sub-stations and equipment, entirely separate from the station facilities wherever possible but accessible to same. In determining the proper location, due weight should be given to the influence of all economic elements such as land values, economy in handling supplies and waste material, and load distribution.

CHECKING OR PROOF OF THE ADEQUACY OF THE DESIGN

General Considerations.—Averages and statistics derived from other terminals, while interesting and helpful, have no final determining value. The facts of record at the terminal under consideration must finally govern. Each facility must be tested by the actual local requirements.

Local Co-ordination.—Consequently when the general design has been accomplished, it is imperative that the final test as to load co-ordination be applied to determine:

That all parts are in balance,

That no individual feature is under or over developed, and

That all feaures will simultaneously reach the saturation point.

Analysis of Operating Capacities.—To accomplish this an analysis should be made of the operating capacity of the approach tracks, throat tracks, and body tracks, as a proper balance of these facilities is of vital importance. Likewise the relative values of practically all supporting facilities in the plan should be measured and balanced to safe-guard the successful future of the development.

As an example, the ticket office size and number of selling windows, can be definitely arrived at as they have a fixed relation to the number of outbound passengers of all classes handled which is, in turn, determined by the ultimate saturation point of the track facilities used in handling out-bound cars.

It should be here specially noted that failure to check or prove the Adequacy of the Design along these lines, accounts for many of the faults and weaknesses in our terminals.

Road Show and Convention in Chicago

Plans for the 1924 convention and road show of the American Road Builders' Association have practically all been completed. These two events are to be held simultaneously the week beginning January 14th. The convention headquarters are to be in the Congress Hotel, Chicago. The road show will be held in the Coliseum and the adjoining Greer Building.

Mr. Frank Page, president of the American Road Builders' Association, has appointed Mr. Chas. M. Upham manager of the convention and road show. Mr. Upham will report directly to the executive committee of the American Road Builders' Association. With the approval of that committee, Mr. Upham will appoint several committees to handle various features of the two big events of the year in the highway industry.

Pavement in Car Track Allowances

Poor car track construction will very quickly wreck an otherwise fairly well paved street. It is still the custom to require the traction companies to pay for the pavement in the track zone—another relic of a day long past. The traction companies do not need the pavement—in fact, without a doubt they would handle more fares if the streets were unpaved! So why should they be assessed for a pavement, to say nothing of cleaning and sprinkling as is the case in many places? It would seem more reasonable to require them to lay trackway substructure and rails adequate for the loads, but to relieve them of the pavement cost. The nature of the trackway has an important bearing in the life and maintenance cost of the street surface above it, so there should be careful consideration of the trackway design by the municipal engineering authorities. It is entirely possible to pave a street, including the track zone, so that there will be a uniform surface from curb to curb; and the rails may be unnoticed to vehicular traffic. As it is, the rails on many streets are the only paths where motors and drays may travel without danger of being wracked, or with a reasonable rate of speed. Under such conditions it is only natural that vehicular traffic should follow the rails, but this is bad for rubber tires and for traction schedules!—Concrete Highway Magazine.

Planning and Designing Small Houses

Planning and Designing Small Houses" is the title of Chapter 1, Volume IV, of the series on "Lumber and its Utilization," just issued in pamphlet form by the National Lumber Manufacturers Association, of Washington, D.. C. The purpose of this chapter in what will ultimately be, it is said, the first authoritative book ever published in America on the general subject is to give architects, builders, contractors and home owners the latest lessons of experience and science in building small houses that will be beautiful, sanitary, fire-resistive and economical. "It is a common sight", says the preface, "in residential sections of our city, to see unsightly rows of houses which are built by the mile and sold by the foot," whereas at no more cost they might be varied and attractive.

The essentials of good architecture are presented briefly, with suitable illustrations. Space is given to discussion of the exterior material of the house, such as clap-boards, shiplap and flat boards, and stucco on metal lath. The importance of using thoroughly seasoned lumber is emphasized and the different species of wood suitable for small house building are discussed. Instructions are given as to the use of siding in its various forms, and also of sheathing and studding, fire stopping and roof coverings. The correct construction of porches and outside details, interior finish, floors, doors, trim, windows, built-in furniture, etc., are all duly covered.

In the four thousand words of this pamphlet any one interested in small house building will find all of the fundamental information necessary preparatory to the erection of a beautiful convenient, economical and delightful home. The distribution is without cost as the pamphlet is a contribution to the general "better homes" movement.

Exhibition Building Enlarged

The Pure Food building, Canadian National Exhibition, is the most unique exhibition structure in America. It has been lengthened from 267 feet to 450 feet this year and boasts among other novel features sunken Italian gardens and open courts.

Mainly Constructional

East and West—From Coast to Coast

Kitchener, Ont., ratepayers recently carried a by-law to purchase the Bridgeport line of the Waterloo and Wellington Railway Company, at a cost of $25,000. The sum of $45,000 will be expended when the line is taken over for the improvement of the road bed, rolling stock and other equipment needed.

Permits were issued recently at Ford, Ont., for a by-products factory, to cost $60,000, a six-storey coal bunker building, to cost $20,000, and a heat treating plant to cost $65,000, for the Ford Motor Company. John V. Gray Construction Company has the contract for the first two buildings and Wells & Gray will erect the heat treating plant.

Montreal is to have a new Homeopathic hospital. A tract of land fronting for 200 feet on Northcliffe and Marlow Avenues, Notre Dame de Grace, and 178 feet deep, has been purchased for $32,500, and a campaign to raise the necessary funds, estimated at between $100,000 and $150,000, will be inaugurated in the near future.

Building permits issued at Windsor for the first 18 days of August show a total value of $292,295, which total includes 52 dwellings. There are no signs of a let-up in building activity and the Building Inspector is of the opinion that Windsor will establish a new record for building this year.

Total sales of cement in Canada during 1922 reached 6,943,972 barrels, exceeding the previous year's total sales by 1,191,087 barrels, according to a report issued by the bureau of statistics. Sales from Ontario amounted to 3,104,000 barrels, averaging $2.06 per barrel, and Quebec 2,660,000 averaging $2.22 per barrel. The selling prices in other provinces was: Manitoba, $2.62; Alberta, $2.33; British Columbia, $3.00. Making a Dominion average of $2.22 a barrel.

Extensive dredging in the harbor at Port Stanley, Ont., is to be carried out by the Dominion Government dredge No. 117, in charge of Captain Hogan.

The Sarnia Oil & Gas Company intend building a plant at Sarnia, Ont., to manufacture carbon black from natural gas. This will be the first plant in the British Empire to manufacture the product from natural gas.

Work is to start soon on the improvements to the harbor at Oakville, Ont.

The builders and supply men of Sarnia, Ont., recently held their second annual picnic at Lake Huron Park.

The new water works system at Port Credit, Ont., was recently opened. Messrs. Gore, Nasmith & Storrie, Toronto, Ont., were the engineers in charge of the design and construction of the work.

The building of a new post office at Kenogami, Que., is contemplated.

Work on the new race course at Niagara Falls, Ont., is rapidly being proceeded with and the property will be handled under the Federal incorporated name of Niagara Falls Land Development Co., Ltd. A three-quarter mile race course will be completed by fall, together with barns to accommodate three hundred horses. The course will be enlarged into a mile ring next spring. Work on the big grand stand is well under way. A country club is being built. The total cost will be in the neighborhood of $150,000. Thirty teams of horses and 100 men are engaged on this work. The site of the new track is on the Wabash steam road and the main line of the Niagara, St. Catharines & Toronto Electric Railway and close to the Sarnia Niagara Falls line of the Canadian National.

The town of Ford, Ont., will erect a 15-room school, which will be ready for occupancy at the opening of the school term in September, 1924. Messrs. Strain & Emery have been awarded the general contract at $163,999. The total cost of the building is estimated at $208,000.

Canadian Foreign Products Ltd. have succeeded Macaulay Pope Ltd., 45 Jarvis St., Toronto. This firm is Canadian representative for Marks poured-in-place gypsum roofs and floors, and agents for the "Kernerator," the incinerator for residences, apartment buildings and institutions.

Personal

R. E. W. Hagarty, consulting engineer, Toronto, has removed his office from the Temple Building, Bay and Richmond Sts., to 81 Victoria St.

Obituary

Word has been received of the death in British Columbia of W. C. Clements, formerly Toronto assistant city engineer. Deceased removed to Vancouver some time ago, where he took the position of city engineer, later retiring. He was born at Niagara Falls, Ont.

CONSTRUCTIONAL ACTIVITY

Period of August 22 to August 28, 1923

Dominion Wide Service Exclusive to "Contract Record & Engineering Review"

Waterworks, Sewerage and Roadways

Edmonton Alta.

Tenders will be received by the City Commissioners till September 10 for the construction of pavement on Alberta Ave. Plans and specifications with the city engineer.

Hamilton, Ont.

Tenders are being received by S. H. Kent, clerk, till September 5 for pipe sewers.

Levis-Sherbrooke Route, Que.

Tenders are being received by J. L. Boulanger, deputy minister, Parliament Buildings, Quebec, till September 13 for gravelling road. Plans and specifications at road department.

Port Stanley, Ont.

Plans are to be prepared for a new pier and also the widening of the harbor, estimated to cost $50,000. H. B. Craig, London, Ont., is the engineer.

Richmond Hill, Ont.

Tenders will shortly be called by James, Proctor & Redfern, consulting engineers, Toronto, for moving the track to the centre of Yonge St., and paving a street 42 ft. wide.

Seaforth, Ont.

The town council contemplates the extension of the water works.

Ste. Tite, Que.

Plans are being prepared for a $25,000 concrete dam. Frank Panneton, Three Rivers, Que., is the engineer; consulting engineer is Romeo Morrisette, Three Rivers, Que.

St. Thomas, Ont.

Tenders are being received by W. C. Miller, engineer, till September 4 for construction of 1,787 ft. of 27 in. to 42 in. sewer, 1,028 ft. of 12 in. to 21 in. sewer and 11 manholes.

Saskatoon, Sask.

Work is to start at once on sewer and water extensions estimated to cost [illegible]

Toronto, Ont.

Tenders being received by C. A. Maguire, Chairman Board of Control, till September 4 for concrete curbs on Fairford, Godfrey, Hilton Luttrell and Walpole Aves., and Hiawatha Rd.

Tenders being received till September 4 by C. A. Maguire, Chairman, Board of Control, for asphaltic pavement on Hiawatha Road.

Tenders being received till September 4 by C. A. Maguire, Chairman, Board of Control, for sewers in Dundurn and Rhyl Aves., Woodfield and Golfdale Roads, Glebeholm, Wolverleigh and Milverton Blvds.

Tenders are being received by C. A. Maguire, Chairman Board of Control, till September 4 for concrete sidewalks on Balliol St., Davisville Ave. and Forsyth Crescent.

Tenders being received by C. A. Maguire, Chairman Board of Control, till September 4 for asphalt pavement on Fairford, Godfrey, Gledhill Glenfern, Hilton and Walpole Aves., and North Place.

Tenders being received by C. A. Maguire, Chairman Board of Control, till October 2nd for water meters. Specifications etc., at Room 12 city hall.

Tenders are being received by C. A. Maguire, Chairman Board of Control, till September 4 for bitulithic pavement on Gillard, Kelbin and Luttrell Aves., Jane St. and Wrenson Rd.

Walkerton, Ont.

Tenders are being received till September 5 by Fred B. James, engineer, for 1 steel stand pipe, 200,000 gals. capacity; 2 gasoline engines and pump 1,000 gals. per minute. 3 small motor driven pumps automatic; 8 in. cast iron pipe and fittings. Plans and specifications with engineer.

Winnipeg, Man.

Tenders will be received by the city clerk, C. J. Brown, till September 4 for construction of 3 granolithic walks. Specifications and form of tenders with city engineer, 223 James St., Winnipeg, Man.

CONTRACTS AWARDED

Blind River, Ont.

McClarty Bros., Sault Ste. Marie, are the contractors for concrete sidewalks to be laid at a cost of $8,000.

Barton Twp., Ont.

The township council has awarded the following contracts for macadamized roads; David and May Aves.—Chas. Brayley; 16th and Queensdale—Canadian Construction Co.

Chilliwack, B. C.

R. H. Love & J. Westbrook are the general contractors for cement sidewalks at $5,198.40.

Chippawa, Ont.

The town council has awarded Andrew Fisher, Niagara Falls, Ont., the contract for sidewalks at $2,000.

Ford, Ont.

The city council has awarded the contract for pavement and curbs to Cadwell Sand & Gravel Co., Windsor, Ont., at $10,594.

The city council has awarded Merlo, Merlo & Ray, the contract for pavement and curbs at $3,969.

Halifax, N.S.

Jas. Cossman is the general contractor for concrete block paving to be laid on Quinpool Road.

Levis, Que.

The city council has awarded the contract for steel tanks to the Canadian Des Moines Steel Co. Ltd., Montreal, Que.

Niagara Falls, Ont.

T. E. Ferris has been awarded the contract in connection with water mains Niagara Falls to Niagara Glen and Dufferin Island etc., at a cost of $11,000.

The city council has awarded the contract for sewer pipe to Clay Products Agency Limited, Toronto, Ont.

Owen Sound, Ont.

The town council has awarded the contract for sidewalks and curbs to Alfred Holstock, Owen Sound, Ont.

Province of Quebec.

The following contracts have been awarded in connection with gravel roads; general contractor, H. Marchessault & Cie—Chatham Twp. at $113,785.54; Chester Twp., southwest part at $49,928.88 and north west part at $18,687.91. St. Christophe D'Arthabaska; west part at $32,291.63.

The Kennedy Construction Co. Ltd., have received the contracts for refection of macadamized roads—Chateguay at $43,963.80; Parish of St. Joachim de Chateauguay at $10,017.50.

Pointe Claire, Que.

The town council has awarded the contract for macadam road to cost $18,000, to McDonnell, Dibblee & Dematto, Montreal.

South Vancouver, B. C.

A. B. Palmer Co., Vancouver, B. C., have received the contract for roadwork on Fraser Ave., at $12,844.

St. Andrews, Man.

Tenders will be received by J. D. Forster, secretary-treasurer, till September 1 for roadwork. Plans, specifications and form of tender with the Good Roads Board, Parliament Buildings, Winnipeg Man., and with the secretary-treasurer.

St. Catharines, Ont.

The city council has awarded Mitchell Contracting Co., London, Ont., the contract for 3,500 sq yds. of concrete pavement.

Toronto, Ont.

The warren Bituminous Paving Co. have received contract for concrete curbs.

Thos. E. Lane, 37 Yorkville Ave., is the general contractor for concrete pavement at $4,102.

Welland, Ont.

The city council has awarded contract for sewers to Chas J. White at $3,673.60.

Yorkton North, Sask.

G. H. Waters, Yorkton, Sask., have

received the contract for 8 miles of roadwork.

York Twp., Ont.
The town council has awarded the following contracts in connection with sidewalks;F. C. Shipp, Toronto $5,700; John Gaffney, West Monkton, Ont.—$1,700; D. McKay, Toronto—$5,300, National Contracting Co., Toronto—$500.00.

Railroads, Bridges and Wharves

Kamloops, B. C.
Tenders will be received by the Minister of Public Works, Victoria, B. C., till September 1 for the construction of a bridge across Thompson River to cost $180.00. Plans and specifications with the Dept. of Public Works, Victoria, B. C.

Lanoraie, Que.
Tenders are being received till September 14 by R. C.Desrochers, secretary, Parliament Buildings, Ottawa, Ont., for reconstruction of concrete wharf. Plans and specifications at dept. offices of district engineers, Shaughnessy building, Montreal, Que., Post Office building Quebec, Que., and Post Office, Lanoraie, Que.

Meteghan, N. S.
Plans are being received by secretary, R. C. Desrochers, Parliament Buildings Ottawa, Ont., till September 13 for extension to wharf.

Nassagawega Twp., Ont.
Tenders being received by Jno. Marshall, clerk, till September 1 on a 26 ft. span clear-16 ft. roadway reinforced concrete bridge. Plans and specifications with clerk and L. W. Chisholm, Reeve.

Niagara Falls, Ont.
The Queen Victoria Niagara Falls Park Commission contemplate the erection of a $7,500 bridge.

Port Stanley, Ont.
Plans are to be prepared, and tenders called at once, for the construction of a new $50,000 east pier in the harbor.

St. John, N. B.
The city council is having plans prepared for a reinforced concrete bridge to cost $16,000; engineer—G. G. Hare.

St. Michel D'Yamaska, Que.
Tenders will shortly be called for the erection of a concrete and steel bridge to cost $10,500.

Tadoussac, Que.
Tenders are being received till September 14 by R. C. Desrochers, secretary, Parliament Buildings, Ottawa, Ont., on extension to headlock of wharf. Plans and specifications at dept offices of Dist. Engineers; Post Office Bldg, Quebec; Shaughnessy Bldgs., Montreal. Que.

Terrace, B. C.
Tenders will be received by the Minister of Public Works till September 1 for steel bridge 25x 400, across Skeena River. Plans and specifications with Dept. of Public Works, Victoria, B. C.

Vancouver, B. C.
The B. C. Electric Railway Company will start at once the laying of about ½ mile of connecting single track line at a cost of $35,000.

Victoria, B. C.
Tenders will be received by city clerk, till September 4, for re-inforced concrete deck and paving extension approaches. Plans and specifications with city engineer, F. M. Preston.

Welland, Ont.
The Department of Railways and Canals is preparing to erect a new bridge over Lock 2, on the old Welland Canal.

CONTRACTS AWARDED

Canso, N. S.
The contract for dredging has been awarded to Wm. McFatridge, Water St.,

Halifax, N. S.
Sydney Construction Co., Sydney, N. S., have been awarded the contract for building $7,700 wharf.

Cayuga, Ont.
The following contracts have been awarded in connection with bridge at Talbot St.; abutments—Canadian Engineering & Contracting Co. Ltd.; steel superstructure—Dominion Bridge Co. Ltd., Toronto.

Pont Rouge, Que.
Kennedy Construction Co. are the general contractors for the building of a subway for the Canadian Pacific Railway.

Wainfleet Twp., Ont.
The Welland County Council has awarded the contract for bridges to R. H. H. Blackwell, 57 Queen West, Toronto, at $31,643.

Public Buildings, Churches and Schools

Beauport, Que.
An addition to the hospital is contemplated by the Sisters of de la Charite, Quebec, Que.

Caledonia, Ont.
Plans for an $80,000 high school are being prepared by Walker & Gibson, architects, 70 Victoria St., Toronto, Ont.

Gladstone, Ont.
Tenders will be received till September 1, by D. A. MacLean, secretary-treasurer Gladstone School Board, to provide and install two-pipe Dunham system steam heating plant.

Kimberley, B. C.
Plans for a $10,000 school are being prepared by Henry Whittaker, architect, Victoria, B. C.

Kenogami, Que.
Tenders have been received by the school board for a hot water heating system.

London, Ont.
The Federation of Church Brotherhoods contemplate building a community hall.

Mount Dennis, Ont.
Work is to start at once on $20,000 church to be erected for Mt. Dennis Baptist church

Work is to start at once on $8,500 church to be built for the St. Johns R. C. Congregation. 1 storey, frame and brick construction.

Nicholet, Que.
Work is to start shortly on alterations to city hall at a cost of $5,000.

Newcastle, N. B.
F. Neil Brodie, architect, St. John, N. B., is preparing plans for a $40,000 Nurses home for the Mirimachi Hospital.

Quebec, Que.
Tenders are being receiver by R. C. Desrochers, secretary, Parliament Buildings, Ottawa, Ont., till September 7 for new iron roofing, in connection with repairs to Immigration Building. Plans and specifications at offices of Chief Architect, Dept. of Public Works, Ottawa, Clerk of Works, Custom House, Quebec, and assistant mechanical engineer, Ottawa, Ont.

Sussex, N. B.
Tenders are being received by R. C. Desrochers, secretary, Parliament Buildings, Ottawa, till September 6 for alterations to post office. Plans and specifications at offices of chief architect, Dept. of Public Works, Ottawa, Res. Arch., General Post Office, St. John and the caretaker, Pub. Bldgs., Sussex, N. B.

Valor, Sask.
Tenders have been received by the school board for the erection of 1 storey school, frame construction.

Val Brillant, Que.
The Roman Catholic School Board contemplate alterations to convent and are in the market for corrugated iron roofing—31 x 75.

Winnipeg, Man.
Work is to start at once on structural alterations to central police station. Wallace & Aikins, Ltd., Winnipeg, Man., are the general contractors.

CONTRACTS AWARDED

Brantford, Ont.
The following contracts has been awarded in connection with $75,000 school being built on Pearl St.: P. H. Secord & Sons Construction Co., Ltd.—general contractors; T. J. Minnes & Co.—electric; plumbing and heating—Chas. Taylor & Co.; plastering and painting to be done by general contractors.

Brooklin, Ont.
Thos. Morrow, Woodville, Ont., is the general contractor for $30,000 school being built.

Burnaby, B. C.
H. D. Crawford is the general contractor of $18,306 school being built.

Charlton, Ont.
The town council has awarded the contract for building court house to cost $6,000, to Albert Johnson & Son.

Edmonton, Ont.
Contracts have been awarded as follows in connection with addition to Nurses' Home (Royal Alexandria Hospital); general contractor— J. Dunlop, at $51,-

[illegible]—J. Carmichael, $3,200; heating—Templeman Bros., $6,189; electric—Economy Electric Co., $1,586. contracts have been awarded as follows for laundry and root house; general contractors—Poole Construction Co. Ltd., $[illegible]; plumbing and heating—Standard Plumbing & Heating Co. Ltd., $3,708; electric—Collin Allan, $876.00.

Fairbank, Ont.

The following contracts have been awarded for addition to Memorial school; masonry—H. N. Dancy; carpentry—Hudson & Moseley.

Ford, Ont.

Strain & Emery, Windsor, Ont, are the general contractors in connection with $210,000 school to be erected near Drouillard Road.

The contract for plumbing and heating in connection with school being built near Drouillard Road has been awarded to C. E. Greenan, Windsor, Ont., at $36,020.

Hornepayne, Ont.

Grant & Hiscock, Sudbury, Ont., have the contract for electric, plumbing, heating and ventilating for school being erected.

Hamilton, Ont.

J. Bryers is the general contractor of a $7,500 church being built corner Garside and Dunsmure Aves.

Haileybury, Ont.

Douglas Bros., Toronto, Ont., have the contract for roofing in connection with $150,000 court house being erected.

Kirkland Lake, Ont.

Messrs. Hill, Clark, Francis Ltd., new Liskeard, Ont., have received the general contract in connection with $40,000 school to be built; 2 storeys, 39 x 64, frame and bishopric construction.

Moncton, N. B.

Trueman Steeves, Gordon St., is the general contractor in connection with repairs and addition to First Baptist church to cost $4,000.

Mellville, Sask.

A. L. Zeigler, Mellville, Sask., has received the contract for erection of a Masonic lodge bulding to cost $9,500.

Montreal, Que.

The following sub-trades have been let in connection with repairs to church on Maisonneuve St.; steel beams—Walsh Plate & Structural Works, Ltd.; electric—Mr. Bleau, Dorchester St. E.

Moose Jaw, Sask.

The contract for plumbing and heating in connection with convent for Sisters of Sion, has been awarded to Moose Jaw Heating & Plumbing Co., at $13,000.

Mitchell, Ont.

The following sub-trades have been let on $50,000 school being built; carpentry—Chas. Kane & Son; sheet metal—A. Sacks & Sons; electric—Public Utilities Commission; painting and glazing—Swan Bros.

Niagara Falls, Ont.

The following contracts have been awarded in connection with $11,000 addition to Nurses' Home on Jepson St.; sheet metal and masonry—O. W. Zimmerman; electric—Arthur Green; plumbing—Flynn Bros.

North London, Ont.

Sisters of Mount Stephen have awarded the contracts for steam heating system as follows: installation—Bennett & Wright Co., Toronto; boilers—E. Leonard & Son.

North Bay, Ont.

Jeffry & Stevens are the general contractors for $26,000 parish hall to be built on Main St. Homer Stockdale has the contract for excavation work.

Outremont, Que.

John Allan, 300 Atwater St., is the general contractor for a $20,000 hall being built on Davarr Ave., for Outremont Presbyterian church.

Port Arthur, Ont.

J. McDiarmid Co. Ltd., Winnipeg, Man., have been awarded the general contract for court house to be erected.

Raymore, Sask.

The School Board has awarded the contract for building of school to Miners & Ball, Saskatoon, Sask., at $17,081, and steam heating contract to Vagg, Wilson & Co., Regina, Sask., at $2,050.

South Porcupine, Ont.

F. Trudell, Timmins, Ont., has received the contract for labor only in connection with $10,000 teachers' residence being built.

Star City, Sask.

Cochrane & McRae are the general contractors for a $34,477 school being built.

Springhill, N. S.

McLellan Bros., are the general contractors for addition to hospital to cost $10,000; plumbing—I. E. Weatherly.

St. Columban, Ont.

Jas Keating, Seaforth, Ont., is the general contractor for school being erected; plumbing and heating—G. Sills, Seaforth; masonry—Mr. Weesenberg, Mitchell, Ont.

Three Rivers, Que.

Germain & Freres have the contract for plumbing, roofing and heating of $50,000 school being built.

Toronto, Ont.

The Board of Education has awarded the following contracts in connection with school work; roofing at Clinton St., $1,420, and roofing at Riverdale, $3,305—W. G. Edge Ltd.; painting and glazing at Runnymede, $2,155—Bavington Bros.; painting at Parkdale, $420—Jas. Phinnemore; ornamental iron at Clinton, $2,282—Shipway Iron & Wire Mfg. Co.; marble work at Silverthorne, $1,668—Geo. Oakley & Son Ltd.

The following sub-trades have been let in connection with church being built corner St. Clair and Bracondale; carpenter—Wilson & Baker; electric—R. A. L. Gray & Co.; plumbing—Hymus & Swift; painting—W. J. Hunt. masonry—Wm. J. Edwards.

A. Jeffrey, 1 Meagher Ave., is the general contractor for $15,000 Sunday school being erected for the Rhodes Ave. Baptist church.

Uno Park, Ont.

J. T. Pointon is the general contractor for erection of school for Union School Section No. 2.

Winnipeg, Man.

Cranstone & Pilgrim are the general contractors for an $8,000 church being erected corner Worth & William Sts., for St. Thomas Anglican church.

Wolfville, N. S.

J. R. Waheham has received the contract for plumbing and heating in connection with the remodelling of theatre with store front and office on Main St.

Business Buildings and Industrial Plants

Asbestos, Que.

Willie Roberge is the owner and builder of a $10,000 store; 3 storeys, 35 x 70, brick construction.

Rosaire Bernier is owner and builder of a $7,500 baker; 3 storeys, 40 x 60, brick construction.

Cochrane, Ont.

The building of a creosoting plant is contemplated by the T. & N. O. Rly.

Dundas, Ont.

The Kaustine Co. Ltd., contemplate building a new factory on Main St.

Fort William, Ont.

Klomp & Hardy are the general contractors for an $85,000 store and office building being built on Victoria Ave.

Halifax, N. S.

The Wanderers A.A.C., contemplate the erection of a club house on Sackville St.

Lachine, Que.

Jas. Stormont, 210—5th Ave., is the general contractor for 2 stores and flat being built on 8th Ave. to cost $20,000.

Oshawa, Ont.

A. S. McLease, Athol St., is the owner of 2 stores and apartments, $7,500, being erected on Simcoe St.; 2 storeys, 50 x 30, solid brick construction.

Oakville, Ont.

The following sub-trades have been let in connection with $18,000 theatre being built: electric—E. Sprowe; plastering—Harry Husband.

Outremont, Que.

Dansereau & Freres, 401 Stuart Ave., contemplate the building of an $110,000 apartment house on Bernard, cor. Outremont. The architect is R. Charbonneau.

Quebec, Que.

Plans are being prepared for erection of stores to cost $200,000 for the Quebec Liquor Commission. The architects are John S. Archibald, Montreal, C. O. Lacrois and Oscar Beaule, both of Quebec, Que.

Sault Ste. Marie, Ont.

McLarty Bros. have the contract for excavating and foundations in connection with $10,000 store block being built on Queen St.

Stuart Lake, B. C.

The Stuart Lake Shingle Co. Ltd., contemplate the erection of a shingle mill to cost $25,000.

Smithville, Ont.

Excavating has started for an elevator and storage to cost $11,000 being built by E. B. Acton, the owner. O. Margison, 67 Adelaide E., Toronto, Ont., is the engineer.

Sangudo, Sask.

Work is to commence soon on a $10,000 creamery for P. Burns & Co. Ltd., of Edmonton, Alta.

Toronto, Ont.

Tenders are being received till September 4th for a brick office building in connection with the Russell car house, Queen east and Connaught Ave. Plans and specifications with Building Dept., Toronto Transportation Commission, 35 Yonge St.

J. H. Kirby, 78 Soudan Ave., is the owner and builder of a store and apartment north east corner Mt. Pleasant Rd. and Erskine Ave., to cost $6,000; 2 storey, 50 x 20, brick construction.

Wm. Steel & Son, architects, are preparing plans of a dye house and manufacturing building at 1179 King West, for the Toronto Carpet Mfg. Co. Tenders will be called by owners about September 1.

The Boake Mfg. Co. Ltd., contemplate building a mill on south side Ranleigh Ave.

Westville, N. S.

Tenders are being received till September 1 by J. Saunders, for electric wiring, electric fixtures, plumbing and heating in connection with $16,000 Oddfellows Hall being built. Specifications at office of "Free Lance" Westville, N. S.

Winnipeg, Man.

Work is to commence soon on 3 stores. $7,000 being built on north side Portage; 1 storey, 32 x 40, tile and stucco construction. W. A. Irish & Co., are the owners and builders.

CONTRACTS AWARDED

Ailsa Craig, Ont.

J. A. McDonald has received the contract for building of Odd Fellows hall and stores to cost $20,000; 2 storeys and basement, 60 x 75, hollow tile and brick construction.

Bridgetown, N. S.

J. H. Hicks & Son are the general contractors for a $9,000 warehouse being built for the Falmouth Fruit Co., Ltd.

Hamilton, Ont.

K. Connor is the general contractor for $4,500 addition to factory for Robinson & Son, 145 MacNab St. N.; masonry—W. Smith; roofing—J. E. Riddell & Son. carpentry—general contractor.

The contract for new building to be erected for the Quaker City Chemical Co., has been awarded to W. H. Cooper.

Haileybury, Ont.

Douglas Bros., Toronto, Ont., have the contract for roofing in connection with $30,000 bank being built on Main St.

London, Ont.

Egget & Co., have received the contract for plumbing in connection with $100,000 warehouse being built on Nightingale Ave.

The following trades have been let in connection with $100,000 apartment being built on Queens Ave.; plumbing—A. Skelly; electric Knowles Electric Co.

Work has started on central heating plant for John Hayman & Sons. Bennett & Wright Co., Toronto, Ont., are the general contractors; boilers—E. Leonard & Sons, London, Ont.

Long Branch, Ont.

J. McNeice has the plumbing and electric contract in connection with a $10,000 garage being built at stop 27, Lake Shore Road.

Montreal, Que.

A. Gendron, 211 Cardinal St., is the general contractor for a public garage being built west side Roberval St. at a cost of $14,200. The owner, J. O. Belair, 115 Archibald St., is in the market for automatic compressor, pump and gas tank.

Toronto, Ont.

The following sub-trades have been let on $18,000 store and apartment being built at north west corner Bloor & Dorval Road:- electric—Leo Snow; plumbing—Harry Ruddick; heating—R. Steen.

H. R. Payne, 58 Harvie Ave., has the contract for plumbing and heating in connection with addition to stores etc., at 96-98 Ascot Ave.

Wm. C. Schunk, 43 Bellevue Place, is the general contractor in connection with residence at 424 Wellington W. being remodelled for factory of Pinex Co.

Montreal, Que.

John McGregor, 44 Closse St., has received the general contract for repairs to rain house to cost $20,000 for the Congoleum Co. Ltd.

The following sub-trades have been let in connection with apartments being built at 73a Famille St.; roofing—H. Beloff; electric—S. Golding; plumbing—J. Becker; plastering—Mr. Goudreau, 1016 St. Urbain St.

The following trades have been let in connection with 2 stores and 6 apartments being built on St. James St.. roofing, plumbing and heating—A Blais; electric—E.Monette; terrazzo floor—E. Lepage.

The following sub-trades have been let in connecton with 3 stores and flats being built corner Sherbrooke and Kingston Ave.; brickwork— Mr. Gignac, Fabre St.; roofing— C. Lusignana & Cie; electric—J. T. Tessier; plumbing and heating—Bergeron & Fils; plastering—Laporte & Pongre.

Turnbull Elevator Co. Ltd., has received the contract for elevators in connection with offices and warehouse being built on Ontario St. E., to cost $500,000.

The following contracts have been awarded in connection with $90,000 apartment house being erected at Atwater and St. Luc Sts.. refrigerator and dumb waiters—Darling Bros.; electric fixtures—L. C. Barbeau & Co., Ltd.

North Bay, Ont.

Wm. Martyn is the general contractor for extension to Doyle's Garage, at a cost of $10,000.

Outremont, Que

John McGregor is the general contractor for a $5,000 warehouse being built for the Steel Company of Canada.

Oshawa, Ont.

F. W. Nash is the general contractor for a $4,000 store and garage being built on Albert St. for Fred Hoehn; 1 storey, 20 x 40, brick construction.

Ottawa, Ont.

Ross-Meagher Co., have received the general contract in connection with new stone face to building at 217 Rideau St., to cost $8,000.

The following sub-trades have been let on $5,000 garage being built at Gilmour and Cartier Sts.; plumbing and heating—Band & Cole; electric—J. W. Ellacot.

The following sub-trades have been let in connection with $25,000 apartment being built on Somerset St.; electric—Marchand Electric Co.; plastering—McNulty & Normand; plumbing and heating—Holloway & Sons.

Prince Rupert, B. C.

Mitchell & Currie, are the general contractors for store and apartment block to be built on Third Ave., at a cost of $10,000.

Port Credit, Ont.

The following sub-trades have been let on store and apartment being built at Stop 34½, Lake Shore Rd.. plumbing and heating—J. Derry, New Toronto; electric—G. McNeice; plastering and painting—J. Woods.

Toronto, Ont.

Drummond Bros., have the roofing contract on $125,000 factory being built on Symington Ave. for Bradshaws, Ltd.

W. A.Moffatt Co., have received the contract for roofing in connection with addition to factory of Massey-Harris Co. Ltd.

W. J. McGuire Limited, have the contract for sprinklers, heating and plumbing system in connection with alterations and addition to factory at 19-23 Charlotte St.

J. Walker, 22 Poucher St., has the contract for heating in connection with 2 stores and apartments being built at 2515 Yonge St.

Work has been started remodelling garage for bowling alley to cost $50,000, west side Sheppard St. Brunswick-Balke-Collender Co. of Canada are the general contractors for bowling alleys.

Vancouver, B. C.

Work is to start at once on addition to store of Sommers, Limited. General contractors—Dominion Construction Co.; electric— J. C. Reston; heating—Leek & Co.

Winnipeg, Man.

The following contracts have been awarded in connection with $13,000 apartment block being built on Dorchester St.: millwork—Acme Sash & Door Co., Ltd.; roofing, sheet metal and ventilating—Can. Rogers Sheet Metal & Roofing, Ltd.; electric—Star Electric Co.; plumbing and heating—Arthur English; plastering—J. M. Malcolm.

The following sub-trades have been let in connection with 7 stores being built at north west corner Portage and Beverley Aves.; electric—Union Electric Co.; painting and glazing—W. Ashall; mis-

[illegible] — Manitoba Bridge & Iron Works, Ltd.

Windsor, Ont.

Arthur Pickering has the plumbing and heating contract for $6,500 store and flats being built on Elsmere Ave.

Arthur Pickering has the contract for plumbing and heating in connection with store and garage being built on Howard Ave.

A. Dufour is the general contractor for garage and 2 flats being built on London St. at a cost of $5,500.

A. Dufour is the general contractor for school and living apartment to be erected on Marion Ave. at a cost of $9,000.

David Marshall, 345 Lincoln Rd., has the contract for plumbing and heating stores and flats being built on Howard Ave.

Residences

Aylmer, Ont.

Emerson McTaggart is the owner of a $4,000 residence being built on Talbot St.; 2 stories, 30 x 32.

Cookstown, Ont.

The walls are now going up for a brick residence being erected for W. H. Lonsway, at a cost of $5,00.

East Toronto, Ont.

C. Gibbs, 11 Albermarle Ave., is the owner and builder of 1 pair residences, $4,500 each, to be erected on Poulton Ave.; 2 stories, 22 x 34, brick construction.

Ford, Ont.

Jeo. L. Reaume is the owner and general contractor for a $15,000 residence being built on Sandwich St.; 1 storey, 90 x 63, tile and parged construction.

Fredericton, N. B.

Work has started for a $6,500 residence being built on George St., for O. C. Hicks; 2 stories, 28 x 32, frame construction.

Hamilton, Ont.

The foundations are going in for 6 residences on Cannon St. E., to cost $24,000. Standard Home Building Company are the owners and general contractors.

Arthur Bell, 443 Maple Ave., is the owner and general contractor of $6,000 residence being built on Cumberland Ave.; 1 storey, brick construction.

Geo. E. Armstrong, 32 Main East, is the owner and general contractor of a $4,500 residence being built on Wentworth Ave. North; 2 stories, brick construction.

W. E. Haywood, 146 Crosthwaite St., is having plans prepared for $4,000 residence; 1 storey, 24 x 35, frame construction.

J. Coombes, 211 Prospect St., contemplates building a $5,000 residence.

London, Ont.

W. C. Nicholls is the owner and general contractor of a $3,800 residence being built on Hamilton Road; 1½ stories, 28 x 30, red brick construction.

Limoilou, Que.

Phillippe Dorion is the owner of a $5,000 residence being built on First Ave.; 2½ stories, 30 x 30, brick veneer construction.

Montreal, Que.

E. Themens, 31 Gouin Blvd. E., is the owner and builder of 4 residences on St. Dominique, to cost $20,000; frame and brick construction.

F. Pilotte, 2050 Chabot St., is the owner and builder of 2 residences on Laurier Ave., to cost $12,000; 3 stories, 25 x 49, frame and brick construction.

J. L. Brown, 324 Patricia St., is the owner and builder of 3 residences being built on Patricia St.; 2 stories, 21 x 27, frame and brick construction.

J. A. Hebert & Freres are the owners and builders of a $6,000 residence on Mariette St.; 2 stories, 31 x 34, frame and brick construction.

Tenders are wanted on all sub-trades in connection with 3 flats being erected on St. Urbain St., to cost $14,000. Louis Averbach, 74 Villeneuve Ave., is the owner.

E. D. Soriol, 1776 Delaroche St., is the owner and builder of a $5,000 residence on Delaroche between Beaubien and St. Zotique; 2 stories, 25 x 50, frame and brick construction.

Oshawa, Ont.

C. Knowles is the owner of a $4,000 residence being built on Dearborn St.; 2 stories, 23 x 27, brick veneer construction. Sheet metal, electric, plumbing and plastering trades to be let by F. W. Watkinson.

Bradley Bros., Simcoe St., are the owners of three residences being erected on Mary St., at a cost of $6,000 each.

R. S. McLaughlin, Parkwood Mansions, is the owner of two residences being erected on Hillcrest St. at a cost of $6,000 each.

Ottawa, Ont.

Deevy Bros., 249 Centre St., are the owners and general contractors of a $6,000 residence being built on Centre St.; 2 stories, 20 x 30, brick veneer construction.

Pointe Aux Trembles, Que.

L. G. A. Castonguay is the owner and builder of a $6,500 residence being erected on Ste. Anne St.

Regina, Sask.

R. W. Johnston is the owner and builder of a $4,000 residence on Dewdney St.; 1½ storey, 22 x 28, frame and stucco construction.

Saskatoon, Sask.

F. Shoquist is the owner and builder of a $5,000 residence corner 6th St. and Victoria Ave.; 2 stories, 24 x 28, frame and stucco construction.

Sandwich, Ont.

Albert H. Howe, 269 Lincon Rd., is the owner and general contractor of a $5,000 residence being built on Felix Ave.; 1½ storey, 20 x 24, frame construction.

W. Ford, 452 Church St., is the owner and general contractor of a $4,000 residence being built on Sunset Ave.; 2 stories, 24 x 34, brick construction.

Wm. R. Pierce is the owner and general contractor of a residence being built on Randolph St.; 2 stories, 24 x 36, brick construction.

W. R. Phillips, 157 Crawford Ave., is the owner and general contractor of a $4,500 residence being built on Sunset Ave.; 1½ storey, 26 x 23, brick construction.

St. Catharines, Ont.

Plans for the erection of a $10,000 residence are being prepared for E. Wingate. 2 stories, 38 x 50, brick construction.

Sydney, N. S.

D. W. Nichol, 199 Whitney St., contemplates building a residence on St. Peters Rd.; 2 stories, frame construction.

O. N. Mann, 117 Cottage Road, is the owner of an $8,000 cottage to be erected on Tain St.; 2 stories, frame construction.

Toronto, Ont.

S. Rostrum, 340 Osler Ave., is the owner and builder of 3 pair residences, $30,000 east side Osler Ave., and wants prices on various materials.

Craig & Madill, 707 Yonge St., are the owners and builders of a $12,000 residence on Frank Crescent. Tenders being received on all sub-trades.

E. L. Reach, 34 Dupont St., is the owner and builder of a $6,500 residence at 96 Colin Ave.; 2 stories, brick construction.

Weismiller & McKenzie, 1425 Queen W., are the owners and builders of 2 residences at 313-15 Glen Road; 2 stories, stone and brick construction.

Gordon R. Lockhart, 52 Hambly Ave., is the owner and builder of a $5,000 residence on Belsize Drive; 2 stories, brick construction.

J. W. Clare, 334 Rushton Road is the owner and builder of a $12,000 residence west side Rushton Road, near High; 2 stories, 24 x 38, brick construction.

The footings are in for 1 pair residences, $6,000 each, being built on Atlas and Horstings Aves.; 2 stories, brick construction. H. Rose, 128 Atlas Ave., is the owner and builder.

The walls are now going up for 3 residences, $6,000 each, on north side High St. near Rushton Road; E. M. Pedwell, 18 Bracondale Road, is the owner and builder.

Thos. A. Lewis, 77 Balfour Ave., is the owner and builder of 2 pair residences, $5,500 at 168-172 Balliol St.; 2 stories, 22 x 36, brick construction.

Maurice Rash, 218 Bellwoods Ave., is the owner and builder of 3 residences, $5,500 each, on Corley Ave.; 2 stories, 22 x 34, frame and brick construction.

Sam Holt, 29 Armadale Ave., is the owner and builder of 2 residences, $5,000 each, west side Armadale Ave.; 2 stories, 21 x 32, brick construction.

A. Howard Forester, 69 Glendale Ave., is the owner and builder of a $10,000 duplex residence south side Patterson and Glendale; 2 stories, 24 x 38, brick construction.

H. J. Barron, 41 Playter Blvd., is the owner and builder of a $4,000 residence at 102 Manor Road; 2 stories, 21 x 35, brick construction.

Work is to start at once on a $7,500 bungalow, west side Humewood Ave.; 1 storey and basement, 35 x 23, brick construction. H. Cockin, 61 Humewood Drive is the owner.

T. Purton, 52 Kenwood Ave., is the owner and builder of a $15,000 duplex residence, east side Spadina Road, near

Burton; 2 stories, 26 x 36, brick construction.

Work is to start at once on 1 pair residences, $4,500 each, on Barker Ave. E. M. Knapton, 68 Waverley Road is the owner.

P. Cole, 245 Garden Ave., is the owner of a $9,000 residence and garage being built on south side Riverside Road; 2 storey, 24 x 34, brick construction.

Cooke Bros., 23 Branstone Road, are the owners of 2 bungalows, $4,000 each, being built on west side Dynevor Road; 1 storey and basement, 21 x 32, frame and brick construction.

Chas. Bauckman, 3 Graham Road, contemplates building 4 residences on north side Broadway Ave., at a cost of $5,000 each.

M. C. Gennell, 198 Parkmount Road is the owner and builder of a $5,000 residence to be erected on Poulton Ave.; 2 stories, 22 x 34, frame and brick construction.

R. G. Sprague, 775 Coxwell Ave., is the owner and builder of a $5,000 residence on Poulton Ave.; 1 storey and basement, brick construction.

Arthur & Arthur are the owners and builders of a $5,000 residence on west side Victoria Park Ave.; 1½ stories, brick construction.

The foundations are going in for 1 pair residences, $7,500, being built on east side Scarboro Road. Jno. Lucas, 206 Gillard Ave., is the owner and builder.

Duncan E. Munroe, 65 Lawton Blvd., is the owner and builder of 14 residences, $15,000 each, to be built on south side Orchard View Blvd.

Wm. A. Booth, 102 Summerhill Gardens, contemplates building two residences on south side Chaplin Ave.

Vancouver, B. C.

J. Nixon, 3663 Cameron Ave., is the owner and builder of a $4,500 residence at 2405 Seventh Ave. 1½ stories, 30 x 36, frame construction.

Windsor, Ont.

G. W. Ford is the owner and general contractor of a $4,000 residence being built on Sunset Ave.; 2 stories, 24 x 34, brick veneer construction.

Albert Lige, 700 Mercer St., is the owner and general contractor of a residence being built on Howard Ave.; 1 storey, 24 x 22.

Albert H. Howe, 269 Lincoln Road, is the owner and general contractor of a residence being built on Felix Ave.

J. Pearcy, 74 Salisbury is the owner and builder of a $3,500 residence west side Westlake near Crew Ave.; 1 storey, frame and brick construction.

Jno. F. Glennie, 17 Pretoria Ave., is the owner and builder of a $4,500 residence on Cambridge Ave.; 2 stories, brick construction.

Jenkins Bros., 26 Bird Ave., are the owners and builders of 1 pair residences being built on Mt. Royal Ave.; 2 stories, brick construction. Tenders being received on plastering, plumbing, heating and electric trades.

A. V. Paddon, 41 Oakvale Ave., is the owner of 1 pair residences being built on north side Strathmore Blvd., near Woodington Ave., to cost $6,000; 2 stories, 21 x 36, brick construction.

J. E. McMillan, 164 Main St., is the owner and builder of a $4,000 residence at 136 Brookside Drive; 1½ stories, brick construction. Also 1 pair residences, $7,000 at 132-4 Brookside Drive.

T. W. Rea, 71 Heath St. W., is the owner of an $8,000 residence being built on north side Teddington Park Ave.; 2 stories, brick construction. Heating, painting, plumbing, plastering and electric trades to be let by owner.

Wm. Salter, 14 Graham Road, is the owner and builder of a $5,000 residence north side Bowood Ave., near Yonge St.; 2 stories, 21 x 35, brick construction.

Ed. Tomlinson, 394 Hillsdale East, is the owner and builder of a $4,000 residence being built on south side Hillsdale E.; 2 stories, 21 x 34, brick construction.

The walls are now going up for a $4,000 residence being built at 233 Waverley Rd. Mr. Clark, 233 Norway Ave., is the owner and builder.

Herman C. Card, 21 Rowland Ave., contemplates building residences on Golfdale Road.

Grant & Leslie, 837 Logan Ave., contemplates the building of several bungalows on Golfdale Road.

Tenders are being received by Craig & Madill, 707 Yonge St., on painting, plastering, electric, plumbing and heating trades in connection with 2 family residence being built corner Carey Road and Cuthbert Crescent; 2 stories, brick construction.

C. Hanwell, 335 Coxwell Ave., is the owner and builder of 1 pair residences, $9,000, east side Cannon near Eastwood Ave.; 2 stories, shingle and brick construction.

J. C. Burroughs, 7 Davisville Ave., is the owner and builder of a $5,000 residence, west side Soudan Ave. and is receiving tenders on carpentry, roofing, painting, plastering, electric, plumbing and heating trades.

A. Nicholls, 149 Wolfrey Ave., contemplates building a $4,000 bungalow on east side Pepler Ave., near Don Mills Road; 1½ stories, brick construction.

Weismiller & McKenzie, 1425 Queen West, are the owners and builders of 2 residences at 313-5 Glen Road; 2 stories, stone and brick construction. Carpentry and masonry trades by day labor.

E. L. Reach, 34 Dupont St., is the owner and builder of a $6,500 residence being erected at 96 Colin Ave.; 2 stories, brick construction.

CONTRACTS AWARDED

Brampton, Ont.

Horton & Smith, Hamilton, are the general contractors for a $25,000 residence being built for Mr. T. W. Duggan.

Barrie, Ont.

J. W. Bishop has contract for electric work on residence being erected for Rev. Dr. McDougal; 2 stories, 28 x 30.

Digby, N. S.

Work has started on bungalow being erected for Mrs. Howard Anderson. John Franklin is the general contractor; heating and plumbing—Ernest Dakin; painting—by general contractor.

Edmonton, Alta.

J. McLeod, 201 Alexandria Block, is the owner of a $3,800 residence to be built on 125th St. R. Gillies is the general contractor. Owner desires prices on materials and sub-trades.

J. Whittaker, 10731—86th Ave., is the general contractor for a $4,000 residence being built for J. Boyers, 9215—99th St.

Ford, Ont.

R. C. Longley, Walkerville, Ont., has the heating and plumbing contract for a $4,000 residence being built on Charlotte St.

L. T. Beno is the general contractor for a $4,000 residence being built for F. E. Ewer; 1 storey, 22 x 36, brick construction.

Excavating has started for a $4,500 residence being built on Raymo Road for Fred Camper, Windsor, Ont. W. R. Phillips is the general contractor.

Granton, Ont.

H. Gibson & Son, Lucas, Ont., are the general contractors for a $9,000 residence being built for A. J. Clatsworthy; 2 stories, 25 x 32, red rug brick construction.

Hamilton, Ont.

J. Dunlop has the plumbing contract for 6 apartments being built on Cannon St. E.

E. G. Budd, 294 Grosvenor North, is the owner and general contractor of 8 residences being built on South Ovale, Westdale, to cost $32,000; 2 stories, brick construction. J. P. Smith, 106 Kensington N., has the contract for plumbing.

Horton & Smith have the general contract for a residence being built for T. Haight, to cost $6,000.

Chisholm Bros. have received the contract for carpentry work in connection with $9,000 residence being erected on Leinster Ave.

Humphrey Bros. are the general contractors for 2 residences, $8,000, being built on Rosslyn Ave. S., for Louis Mulligan.

London, Ont.

Webster Construction Co., are the general contractors for a $5,500 residence being built on Victoria St. for R. H. Smith.

R. Moon is the general contractor of a $3,800 residence being built on Delaware Ave. for H. Smith, 1045 Mable St.; 1 storey, 22 x 36, red brick veneer construction.

Leamington, Ont.

A. E. Law has the contract for electric work on residence being built on Robinson St. Cross Bros., have the contract for plumbing.

Mimico, Ont.

The following sub-trades have been let on $4,000 residence being built on Primrose Ave.: masonry—A. Herod & Son; carpentry—W. J. McClintock; plastering—T. Fish; plumbing—J. H. Doughty.

W. J. McClintock, Mimico Beach, is the owner of residence being erected on Eastborne Crescent: masonry—R. Herod & Son; electric—Warner & Fordyce; plastering—T. Fish; plumbing and heating—J. H. Doughty.

Montreal, Que.

O. Lavoie & Fils have the roofing

(Continued on page 51)

Tenders and Proposals

Official Notices by Governments, Municipalities, Architects and Engineers

Tenders Wanted

[illegible] concrete bridge in Nassa[illegible] [illegible] 26 ft span clear, width 16 [illegible]

Plans and specifications to be seen at the office of J. Marshall, Clerk, or at the home of I. W. Chisholm, Reeve.

Tenders to be closed on Sept. 1st., 1923.

The lowest or any tender not necessarily accepted.

JOHN MARSHALL, Clerk,
Campbellville P.O., Ont.
34-35

City of St. Thomas

Tenders for Sewers

Tenders will be received by the undersigned until noon, Standard Time,

Tuesday, September 4th, 1923,

for the construction of—

1787 feet of 27-inch to 42-inch sewer.
1028 feet of 12-inch to 21-inch sewer.
11 Manholes.

Profiles can be seen, and plans, specifications and forms of tender obtained on application to the undersigned.

Lowest or any tender not necessarily accepted.

W. C. MILLER,
City Engineer.
34-35

TOWNSHIP OF MINTO

TENDERS for Municipal Drains

SEALED tenders will be received by the undersigned until [illegible]

Monday, September 17th, 1923,

for [illegible] of Municipal Drains Nos. 12, 16, & 17 in the Township of Minto, consisting of a total of 14542 Cu. yds. of excavation in open ditch and 14280 lineal feet of Tile [illegible]

Plans, Profile and Specifications may be seen at the office of the undersigned, Harriston, Ont.

An accepted cheque for 5% of the amount of the Contract will be required to accompany each tender and the successful tenderers will be required to furnish a Guaranty Bond for FIFTY per cent. of the amount of the Contract. The Township of Minto will pay the Premium.

Separate Tenders will be required in each Drain and on No. 17 separate Tenders for open ditch and Tile Drain.

The lowest or any tender not necessarily ac[illegible]

W. D. McLellan,
Clerk of the Township of Minto,
Harriston, Ont.

RATES

20 cents per agate line (14 lines to the inch) Position Wanted 1 cent per word per insertion. Positions Vacant 2 cents per word per insertion. Box number 10 cents extra. Advertisements for this Section must be received not later than noon on Tuesday to ensure insertion in Wednesday issue.

City of Toronto

Tenders for Water Meters

Tenders will be received by registered post only, addressed to the Chairman, Board of Control, City Hall, Toronto, up to 12 o'clock noon, **October 2nd, 1923,** for the following:

Tender No. 54—Water Meters

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and Form of Tender may be obtained at the Works Department, Room 12, City Hall, Toronto.

Tenders must comply strictly with conditions of City By-law as to deposits and sureties, as set out in specifications and Form of Tender.

The lowest or any tender not necessarily accepted.

C. ALFRED MAGUIRE (Mayor),
Chairman, Board of Control.
35

Sealed tenders addressed to the undersigned, and endorsed "Tender for breakwater extension at Port Arthur, Ont.," will be received at this office until **12 o'clock noon (daylight saving),**

Thursday, September 20, 1923,

for the construction of a section of rubble mound breakwater in the Main Harbour (North) at Port Arthur, District of Port Arthur and Kenora, Ont.

Plans and forms of contract can be seen and specification and forms of tender obtained at this Department, at the offices of the District Engineers, Custom-House Building, Fort William Ont.; Custom-House Building, Port Arthur, Ont.; Equity Building, Toronto, Ont., and Shaughnessy Building, Montreal, Que.

Tenders will not be considered unless made on printed forms supplied by the Department and in accordance with conditions contained therein.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Minister of Public Works, equal to 10 p.c. of the amount of the tender. War Loan Bonds of the Dominion will also be accepted as security, or War Bonds and cheques if required to make up an odd amount.

Note.—Blue prints can be obtained at this Department by depositing an accepted bank cheque for the sum of $50.00, payable to the order of the Minister of Public Works, which will be returned if the intending bidder submit a regular bid.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, August 27, 1923. 35-36

DEPARTMENT OF ROADS

TENDERS

Levis-Sherbrooke Highway

Tenders made on forms supplied by the Department of Roads and placed under envelopes bearing the words: "Tender," followed by the name of the interested highway and of the municipality, shall be received at the office of the Minister of Roads, in the city of Quebec, Government Building, until twelve o'clock of the afternoon (Eastern Standard time), on

Thursday the thirteenth (13) of September, 1923,

for the construction in gravelling of Levis-Sherbrooke Highway in the municipalities of the townships of Somerset Sud, length 26,300 feet and Somerset Nord, length 27,908 feet.

The Government of the Province of Quebec does not bind itself to accept any of the tenders.

Quebec, August 22nd, 1923.

J. L. BOULANGER,
Deputy Minister.
35

Tenders Wanted

Town of Riverside, Ontario

Sealed tenders will be received by the undersigned until six o'clock P.M. on

Thursday the sixth day of September, 1923,

for supplying all materials, labor, tools and equipment necessary for the laying and completion of Riverside Drive Interceptor and Ottawa Street Trunk Line Sewers, according to plans, specifications, etc., prepared by R. W. Code, C. E., Windsor, Ont.

The estimated cost of the work is $90,000.00. A certified check for five per cent. of the amount of the tender is to accompany each tender, said cheques are to be made payable to the Treasured of the Town of Riverside, and to be subject to forfeiture in case of failure on the part of the successful tenderer, to enter into a written contract with the Town of Riverside with approved sureties when called upon to do so.

All tenders must be submitted on forms supplied by the Engineer.

Plans, etc., may be seen at the office of R. W. Code, 116 Chatham Street West, Windsor, Ont.

The Council reserves the right to reject any or all tenders or to accept any tender.

C. J. McHugh,
Town Clerk,
Riverside, Ont.
35

Dated at Riverside this 24th day of Aug. 1923.

TOWNSHIP OF ETOBICOKE

Sidewalks

Sealed tenders plainly marked as to contents will be received until 5 P.M. on

Thursday, Sept. 6th, 1923,

for the construction of approximately 19,300 square feet of Cement Concrete Sidewalks.

Plans and specifications may be seen at the Township Offices, Islington.

The lowest or any tender need not necessarily be accepted.

N. MacNicol,
Township Engineer
Islington.
35

COUNTY OF PEEL

Tenders for Grading

Sealed tenders, plainly marked with the contents, will be received by the undersigned up to noon,

Thursday, September 6, 1923,

for approximately 5,000 cubic yards of grading on the 4th Line Hill, South of Huttonville. Profile and further information at the office of the undersigned, Court House, Brampton, Ont.

N. L. POWELL,
County Road Superintendent.
Brampton, August 28, 1923. 35

Wanted to Rent

Keystone Excavator. State terms and where located. Box 366, Contract Record, Toronto. 35

For Sale

One 10 E. Austin Cube Mixer, traction wheels, in very good condition. Cash price reasonable. Chick Contracting Co. Ltd., Windsor, Ontario. 35-37

For Sale

One new Style "C" 18" x 33", centres Barber-Greene portable belt conveyor, mounted on one type F-5-18 semi-adjustable truck complete with one 3 H. P., 60 cycle, 200 volt AC motor complete. Lyons Fuel & Supply Company, Sault Ste Marie, Ont. 35-36

For Sale

1—Sawyer Massey Road Grader.
1—50 ton bin and screen, with elevator and buckets.
1—London paver.
Box 291, Contract Record, Toronto. 30 t.f.

STEEL PILING

Bought and Sold

Universal Equipment Company

28-t.f. Niagara Falls

FOR SALE

3 Drum Lidgerwood Hoist 65' Boom. 8" x 8" Compressor and Motor on Trucks. 12 x 16 Crusher. 6 cu. ft. Gasoline Mixer. Also other equipment. J. G. Sipprell, Box 495, Halifax, N.S. 33-36

Construction accountant seeks position—ten years experience construction and industrial work. Available immediately. Box 361, Contract Record, Toronto. 34-37

FOR SALE

1 D.C. 200 Amp. 125 volt, C.G.E. Dynamo direct connected to a 9 x 10 "Ideal" Goldie & McCulloch Engine.
1 D.C. 114 Amp. 220 volt, C.G.E. Dynamo direct connected to a 9 x 10 Robb Armstrong Engine.
1 D.C. 1040 Amp. 240 volt, directly connected to an Allis Chalmers Vertical Engine.
2—200 H.P. Motors, 2200 volt, A.C., 60 cycle, 900 R.P.M. Directly connected to 2 Worthington 12 inch turbine pumps, capacity each 1,000,000 gals. every 24 hrs. against 90 ft. head.
(Motors or pumps may be had separately)

Also other electrical equipment such as starters, switchboards, etc. This apparatus is in first class condition and may be had at a very low price. Apply C. G. Arthur & Son, Box 711, Midland, Ontario. 35

Position wanted—Civil Engineer, presently employed, seven years experience in highway, pavement and railway construction, surveys and engineering office practice, neat draftsman. Position desired with industrial corporation, contractor or municipal engineering firm. Apply Box 358, Contract Record, Toronto. 34-35

Some One Wants to Buy

The equipment or machinery that you are not using.

It may be occupying valuable space in your yard or shop, collecting dust, rust and hard knocks.

Sell it before "Depreciation" scraps it.

Use the **Tender & Proposals Department.** It helps others, let it help you.

Residences

(Continued from page 49)

contract in connection with 2 residences being built on Casgrain St.

A. Laquerre, 1647 Chabot St., is the general contractor on 2 residences being built on Papineau St. to cost $10,000; 3 stories, 44 x 45, frame and brick construction.

The following sub-trades have been let on 2 residences being built on Papineau Ave.: electric—Mr. Gascon, 714 Cartier; plumbing and heating—L. Dalcourt.

The following sub-trades have been let on 2 residences being built on Chamblay St.: masonry—P. Martineau; roofing—J. X. Guay; electric—G. C. Dechaine; plumbing—R. Demais.

O. Labelle has received the contract for electrical work in connection with 4 residences being built on Marlow Ave. at a cost of $30,000.

The following sub-trades have been let in connection with $10,000 residence being erected on Bourbonniere St.: roofing—Mr. Lacomte, Parthenais Ave.; electric—Mr. Lefreniere, 9th Ave.; plastering—J. A. Lacombe.

The following sub-trades have been let on 3 residences being built on St. Antoine St.: millwork—Paul Greaves; roofing—V. Cote; electric—E. Mongrain.

Sub-trades have been let as follows on $5,000 residence being built at 3710 St. Dominique St.: plumbing C. Gauthier & Co.; plastering—D. Pare

The following sub-trades have been let on $26,000 residence being erected on Maplewood Ave.: millwork—Millen & Frere; roofing, plumbing and heating—C. Martel; tiling—Dussand, Mongeon & Joli; brickwork—Jos. Brodeur.

O. Labelle, 405 Decarie Boulevard has the contract for electric work on 4 residences being built on Marlow Ave. at a cost of $30,000.

The foundations are now going in for a $7,000 residence being built on St. Denis. C. H. Cote, 47 Monk Boulevard, is the general contractor.

The following sub-trades have been let on 2 residences being built on Chambly St: masonry—P. Martineau; roofing—J. X. Guay; electric—G. C. Dechaine; plumbing—R. Demais.

Frank Charles, 86 Decarie Blvd., has the contract for plastering on $25,000 residence being built corner Trafalgar and Mt. Pleasant.

The following sub-trades have been let in connection with $6,000 residence being built on Bercy St.: masonry—L. Bourgie; roofing—A. Quay; plumbing—Mr. Cote, 397 Bercy St.

W. Cousineau, 1659 Notre Dame West, has the contract for electric work on $6,000 residence being built on Melrose Ave.

Richardson & Simard has the roofing contract on a $28,000 residence being built on St. Catherine Road.

The following sub-trades have been let in connection with 4 residences being built on Gilford Ave.: millwork—E. Magnan; roofing and plumbing—Jos. Labelle; plastering—Cusson & Lapierre; painting—D. Valiquette.

The following sub-trades have been let on 3 residences being built on Belgrave Ave. for J. & R. Parisien, 230 Harvard Ave.: roofing—Jos. Lamarche; electric—Mr. Martel, care of owner; plumbing and heating—A. Durand; plastering—A. Leonard; painting—Mr. Assel, care of owner.

The following sub-trades have been let on $7,000 residence being built on St. Denis for U. Robitaille; masonry—J. Binnette; roofing—E. Laurin; electric—Chas. Laurin; plumbing—O. Lavoie; plastering—Mr. Perron, 58 Darling St.

Daniel Kochenburger has the roofing and plumbing contract and A. Boisnenu the contract for electrical work in connection with $10,000 residence being erected on Boyner St.

The following sub-trades have been let on $10,000 residence being built on Christophe Colomb: electric—A. Boisnenu; roofing and plumbing—Daniel Kochenburger.

C. H. Doquette, 47 Blvd. Monk, is the general contractor for a $7,000 residence being built on St. Denis between Decastelneau and Jaillon; 3 stories, 25 x 62, frame and brick construction.

Moose Jaw, Sask.

P. Dalgleish is the general contractor for a $5,000 residence being built on Ross St. for Mrs. Romans, High St. W.; 1½ storey, 32 x 40, stucco and shingle construction.

Ottawa, Ont.

The following sub-trades have been let on 6,000 residence being built on Foster St.: plumbing and heating—Capital Hardware; plastering—Wm. Skillen.

The following sub-trades have been let on $6,000 residence being built on Powell Ave.: plumbing and heating—Gervin &

Hodgins; electric—Ernest Tresidder; [illegible] Wm. Skellen.

The following sub-trades have been let on [illegible] residence being erected on [illegible] Ave.: plumbing and heating—Band & [illegible]; electric—J. W. Ellacot.

Sub-trades as follows have been let in connection with $9,000 residence being built on Clemow Ave.: plumbing and heating—Gervin & Hodgins; electric—J. W. Ellacot; plastering—Davis-Daly.

The following sub-trades have been let on $9,000 residence being built on Gilmour St.: plumbing and heating—Band & [illegible]; plastering—Wm. Green; electric—[illegible] Thompson.

The following sub-trades have been let in connection with $4,000 residence being built on Caroline Ave.: plumbing—[illegible] & Hodgins; heating—Pease Foundry; electric—Norman Young; plastering—T. Squirrell.

The following sub-trades have been let on $9,000 residence being built on Gilmour St.: plumbing and heating—Band & [illegible]; plastering—Wm. Green; electric—[illegible] Thompson.

The following sub-trades have been let on double residence being built on Ossington Ave.: plumbing—W. Allen; heating—Capital Hardware; plastering—Bowman Bros.; electric—J. E. Cherry.

Gervain & Hodgins are doing the plumbing and heating, and Hunt & Baker the plastering, for residence being built on Hampton Ave. for Miss Roos, 42 Grange Rd.

E. Belanger, 111 Fairmont Ave., is the general contractor for a $5,000 residence being built at 41 Fairmont Ave. for P. MacLaren, Aston, Ont.

The following sub-trades have been let on $5,000 residence being on Hamilton Ave.: plastering—J. Hobbs; heating—Beach Foundry; electric—J. Young, 7a Poplar St.; plumbing—A. W. Allen.

Outremont, Que.

The following sub-trades have been let in connection with $18,000 residence (flats) being built on Duverger Ave.: roofing—Jos. Lamarche; plumbing—Demars & Lefebvre; plastering—Mr. Lapierre, 689 Garnier; painting—L. Lamoureaux; masonry—Mr. Frenette, 397 St. Catherine Road.

Point Grey, B. C.

Brown & Ayers are the general contractors of a $6,000 residence being built on Adera St. for H. T. Hunter; 1½ storey, 27 x 39, frame and stucco construction.

Port Colborne, Ont.

The following sub-trades have been let on $5,000 residence being erected on Bell St.; general contractor—John Cook; masonry—Frank Shisler.

Port Credit, Ont.

P. Dixon is the general contractor for a $6,000 residence being built on Mineola Rd.; electric, heating and plumbing—J. MacMahon; painting—J. W. Scott; plastering—general contractor.

The following sub-trades have been let in connection with $6,000 residence being built on Cumberland St.: plumbing and heating—J. H. Doughty; electric—J. McMahon; painting—H. Long.

The following sub-trades have been let in connection with 12 semi-detached residences being built on Elmer Ave.: painting—G. B. Reid; electric—Mr. Moore, Centre Road, Port Credit; heating and plumbing—J. Derry, New Toronto.

The following sub-trades have been let on $5,000 residence being built on Minewawa St.: plumbing and heating—G. Barlow; electric—G. McNeice; painting and plastering—J. Woods.

The walls are now going up for a $6 000 residence being built for Wm. Nicol: general contractor—P. Dixon; electric, heating and plumbing—J. MacMahon; painting—H. Long; plastering by the general contractor.

The following sub-trades have been let on $5,000 residence being built on Aviation Road: plumbing and heating—C. Barlow; electric—G. McNeice; painting—H. Long.

Quebec, Que.

Frs. Jobin, 182 Latourelle St., is the general contractor for a $17,500 residence being built on Bougainville St. for L. A. Roy; 2 stories, 30 x 40, brick construction.

Regina, Sask.

Dingle & Holmes are the general contractors for a $6,400 residence being built on Victoria Ave. for Jas. Cooksley; 1½ stories and basement, 24 x 28, frame and stucco construction.

R. G. Fowler is the general contractor for a $5,000 residence being built on Osler St. for T. Falls.

Sudbury, Ont.

The following sub-trades have been let on $9,000 manse being built for Presbyterian church: plastering—Joe Ross; painting—Mills Bros.

St. Catharines, Ont.

The following sub-trades have been let in connection with $4,000 residence being built corner Haig & Dufferin Sts.: sheet metal, plumbing and heating—J. Haines; electric—A. B. Cudney; painting—Smith & Gill; plastering—Swan & Dakers.

Sault Ste. Marie, Ont.

The following sub-trades have been let on $4,000 residence being built on John St.: electric—Taylor Bros.; plumbing and heating—J. A. Stone; plastering—Wm. Murdock.

Ste. Therese, Que.

The following sub-trades have been let on $10,000 cottage being built for Dr. A. Lamarche; electric—Goudreau & Frere; plumbing and heating—Viau & Frere.

Saskatoon, Sask.

W. J. Black is the general contractor for a $6,000 residence being erected on 11th St. E., for Miss E. G. Melvin.

Toronto, Ont.

The following sub-trades have been let on $25,000 residence being built on Forest Hill Rd. for H. H. Horsfall, Leaside: plastering—E. W. Taylor; painting—Thos. Stewart; masonry—Albert Venn; carpentry—Ed. Eyre. Tenders being received by Edwards & Edwards, architects, 18 Toronto St., on plumbing and heating.

Depth & Sons, 44 Grove Ave have the contract for masonry work in connection with $9,000 residence on Alberta Ave.; 2 stories, 24 x 36, brick construction.

The following sub-trades have been let on $5,000 residence being built at 67 Chesterhill Road.

R. J. Ritchie, 851 Logan Ave., has received the plumbing and heating contract on $6,000 residence being built at 155 Cambridge Ave.

The following trades have been let on $4,000 residence being erected on west side Elmer Ave. near Rhyl: electric—E.

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The following sub-trades have been let on $20,000 residence being built at 4 Woodlawn Ave. E.: carpentry—A. W. Homan; heating—J. Walker; plastering—Harry H. Bremner; painting—A. C. Garwood; tiling—Italian Mosaic & Tile Co., Ltd.; electric — Roxborough-Dean Ltd.; plumbing—Walter Wray. Carpenter contractor previously reported as J. D. Yound & Con., in error.

The following sub-trades have been let on pair residences being built at 239-331 Waverley Rd.: electric—Mr. Richardson, Firstbrooke Ave.; plumbing—J. Foster; plastering—W. Baker.

The following sub-trades have been let on 1 pair residences to cost $7,000 being built on west side Lawlor Ave.: plumbing—L. Hollows; heating—Rumley & Thomson; plastering—W. Bygrave.

The following sub-trades have been let for $4,000 residence being erected at 310 St. Clements Ave.: heating—J. Walker; plumbing — Geo. Moore; electric — E. Warman.

Victoria, B. C.

Hunter & Halkett are the general contractors for a $4,000 residence being erected on Beach Drive for Herbert Carmichael, 1256 St. Denis St., Victoria, B. C.

Alex. McCrimmon is the general contractor for a $5,200 residence being built in the Oak Bay district for T. S. Gore, 2314 Oak Bay Ave.

Westmount, Que.

The following sub-trades have been let in connection with $25,000 residence being erected corner Trafalgar and Mt. Pleasant: masonry—Morrison Quarry Co.; millwork—D. Crecinn & Co.; roofing—Douglas Bros.; plumbing and heating—Hickney & Aubut; plastering—The Curwood Co.

Wolfville, N. S.

The foundations are in for a $9,000 residence being built on Summer St. The following sub-trades have been let: electric—J. C. Mitchell, Wolfville; heating and plumbing—B. L. Cox, Greenwich, N. S.

Windsor, Ont.

Bateman & Tesch have the contract for plumbing and heating in connection with $4,500 residence being built on Elsmere Ave.

A. Dufour, 205 Marentette Ave., is the general contractor for a $10,000 duplex residence being built on Goyeau St. for Jos. Peters, 216 Windsor Ave.

Winnipeg, Man.

A. Pollock, 182 Rupertsland Ave., is the general contractor of an $8,000 residence being erected on west side of Montrose, between Kingsway and Academy; 2 stories, 32 x 27, frame and stucco construction.

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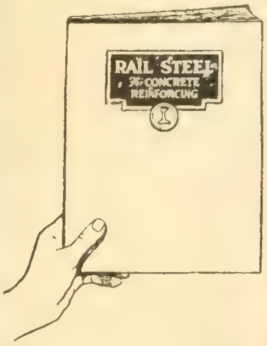

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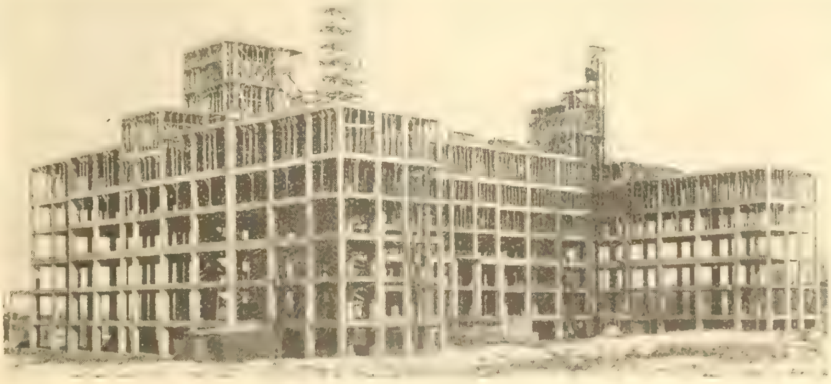

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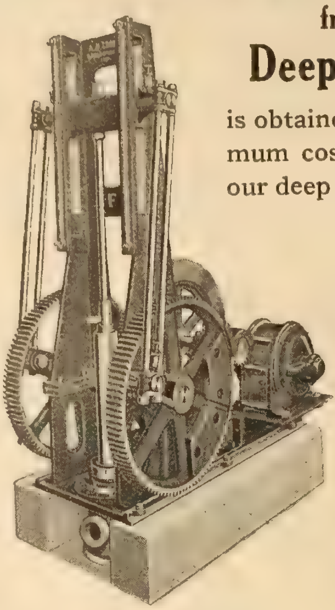

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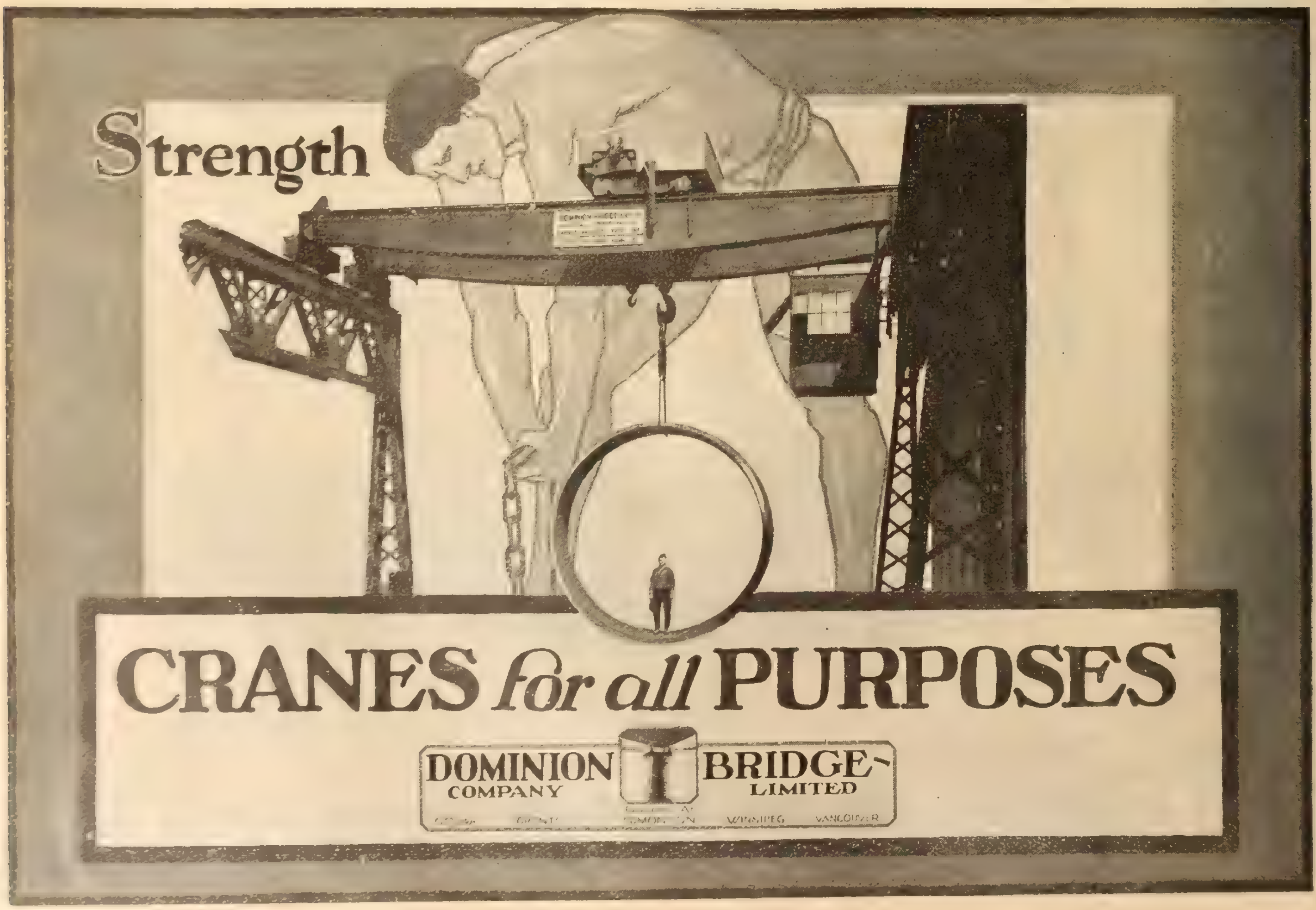

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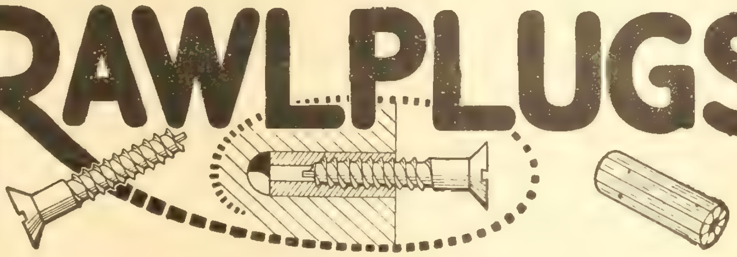

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Current Prices of Building and Engineering Materials

CEMENT (Delivered on job):—		Toronto	Montreal	Winnipeg	Vancouver
Retail lots including bags	per bbl.	$4.60	$4.16	$4.80	$3.70
Car lots, including bags	per bbl.	3.60	3.48	4.20	3.45
Refund on bags	each	.20	.20	.20	
LIME (Delivered on job):—					
Lump, in retail lots	per ton	14.30	13.00	.58 bu.	2.70 bbl
Lump, in car lots	per ton	12.70**	10.00	13.80 ton*	2.60 bbl
Hydrated, white in retail lots	per ton	20.00	26.00	.63 bag*	25.00
Hydrated, white in car lots	per ton	19.00	21.00	.56 bag*†	25.00
Hydrated, grey in retail lots	per ton	18.75	17.75		
BRICK and TILE (Delivered on job):—					
Common face brick	per M.	24.00	16.50*	19.00	25.00
No. 1 dry pressed brick	per M.	31.00	30.00	36.00	65 00
No. 2 dry pressed brick	per M.	29.00	25.00	32.00	
Enamelled brick	per M.	125.00 up	180.00	185.00	150.00
Wire cut brick, for foundation work	per M.	21.00	19.00		40.00
Sand lime brick	per M.	17.00		18.00	
Hollow building tile	per M.			8-12c. per ft.	105-240,00
Paving brick imported	per M.	on appl.	100.00	55.00	60.00
Fire brick	per M.	60-95	60-75	85-100	70.00
Fire clay	per ton	13-20	15-16.00	35.00**	20.00
STONE, SAND and GRAVEL (f.o.b. cars on siding):—					
Crushed stone, 2 in.	per ton	2.05**	1.80	2.45 yd.*	$2.75 yd.
Crushed stone, 1 in. and under	per ton	2.31	1.90	2.75 "	" "
Crusher run	per ton	2.20½		3.00 "	" "
Rubble stone	per ton	2.45	1.70	15.00 cord	" "
Gravel, 2 in. screened	per ton	2.05		2.45 yd.	" "
Gravel 1 in. screened	per ton	2.31	1.50	2.75 "	" "
Sand, screened	per ton	1.42½	1.25	1.90 yd.	2.50 yd.
Pit run	per ton	1.52¾	1.25	1.90 "	" "
STEEL and IRON (f.o.b. warehouse):—					
Mild steel bars, ¼ in. and heavier	per 100 lbs.	3.90 base	4.00 base	4.60	4.00
Bands 3/16 in. and lighter	per 100 lbs.	4.50 "	4.50 "	5.10 base	
Hoops	per 100 lbs.	5.00 "	5.00 "		
Angles, channels and tees under 3 in.	per 100 lbs.	4.50 "	4.00 "	5.35	6.00
Structural shapes	per 100 lbs.	4.25 "	4.25 "	5.05 base	6.00
Plates—¼ in. and heavier	per 100 lbs.	3.75 "	3.90 "	5.15	6.25
Plates—3/16 in.	per 100 lbs.	4.25	4.25 "	5.55	6.50
Plates—10 gauge	per 100 lbs.	4.60	4.50 "	5.45	6.50
Black sheets—28 gauge	per 100 lbs.	5.60	5.00 "	6.50	8.25
Galvanized sheets—28 gauge	per 100 lbs.	6.65	7.00 "	7.85	9.35
Galvanized Corrugated sheets—28 gauge	per 100 ft.	7.00	7.00 "	7.70	8.25-8.50
Rivets	per 100 lbs.	6.25 base	6.00 "	7.00 base	
Cast iron pipe	per ton	67.50 "	60.00 "		
VITRIFIED CLAY PRODUCTS (Delivered on job):—					
Sewer pipe, 4 in.	per ft.	.40	.30	.35	.25
Sewer pipe, 6 in	per ft.	.60	.45	.45	.35
Sewer pipe, 8 in.	per ft.	.80	.70	.60	.45
Sewer pipe, 9 in.	per ft.	1.00	.85	.70	.60
Sewer pipe, 10 in.	per ft.	1.20	1.05	.80	.55
Sewer pipe, 12 in.	per ft.	1.50	1.35	1.00	.65
Sewer pipe, 15 in.	per ft.	2.25	1.80	1.85	.95
Sewer pipe, 18 in.	per ft.	3.00	2.50	2.45	1.50
Sewer pipe, 21 in.	per ft.	4.00	3.00		1.90
Sewer pipe, 24 in.	per ft.	6.00	4.50	3.75	3.10
Tile wall coping, 8 or 9 in	per ft.	.60	.50		.50
Tile wall coping, 12 or 13 in.	per ft.	.90	.75		.60
Flue lining, 8½ x 8½ in.	per ft.	.70*	.60	.55	.40
Flue lining, 8½ x 13 in.	per ft.	1.00*	.90	.65	.75
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Flooring, 1 x 3 and 4 in., clear, E. G. fir	per M.	100.00	60.00	94.50	65.00
Flooring, 1 x 3 and 4 in., clear, F. G. fir	per M.	75.00	65.00	63.00	45.00
Flooring, No. 1 pine	per M.	75.00	80.00	64.80	
Flooring, No. 1 Spruce	per M.	52.00	45.00	40.50	
Flooring, birch and maple, 13/16 in. clear	per M.	135.00	110.00	171.00	200.00
Flooring, plain red oak, ⅜ in. clear	per M.	145.00	125.00	157.50	265.00
V joint, 1 x 3 and 4 in., Nos. 1 and 2, clear, fir	per M.	75.00	65.00	63.00	45.00
V joint, No. 1 pine	per M.	75.00	85.00	63.00	
Pine, 1 x 4 to 12 in., common rough	per M.	46/61	45.00	67.50	
Red and Jack Pine, 2 x 4 to 12 in., com. rough	per M.	48/58	70.00	40.50	
Hemlock, 2 x 4 to 12 in.	per M.	43/48	40.00	42.50	11.50-18.75
Fir, 1 x 4 to 12 in. No. 1 common, D 1 S	per M.	40–50.00	50.00	38.70	20.00/25.00
Spruce, 1 and 2 x 4 to 12 in.	per M.	48/60	45-35	38.70	
Timbers, fir, 10 x 10 in. and up	per M.	70.00	58.00	55.00 base	17.-22.00
Lath, No. 1 white pine	per M.	16.00	12.00	12.60	
Lath, M. R. spruce	per M.	10.00	8.50	11.25	7.00
Shingles, XXX B.C. cedar	per M.	6.25	5.00	6.30	3.40
XX B.C. cedar	per M.	4.50	4.25	4.50	1.90
N.B. extras	per M.	6.50	6.75		
N.B. clears	per M.	6.00	5.50		
Pine casing	per M.	1 ct. per in.	95.00	115.00	55.00
Fir casing	per M.	1¼ ct. per in.	100.00	115.00	70.00
PAINTS, OILS, COLOURS (delivered):—					
White lead ground in oil, less than ton lots	per cwt.	13.25	14.60	15.60	16.30
Red lead, dry, small lots	per cwt.	17.00	9.55	22.00	14.50
Putty in bulk	per cwt.	5.95	4.25	5.50	6.50
Steel sash putty in bulk	per cwt.	6.45	6.00	8.00	7.75
Boiled linseed oil, in bbls.	per gal.	1.28	1.40	1.26	1.56
Raw linseed oil, in bbls.	per gal.	1.25	1.38	1.23	1.53
Turpentine, in bbls.	per gal.	1.45	2.20	2.50	2.80
Mortar Color, maroon, in bbls.	per lb.	.02¼		.06 9/10	6.45 per cwt.
Mortar Color, black, in bbls.	per lb.	.08		.06 4/5	.45
PLASTER (Delivered):—					
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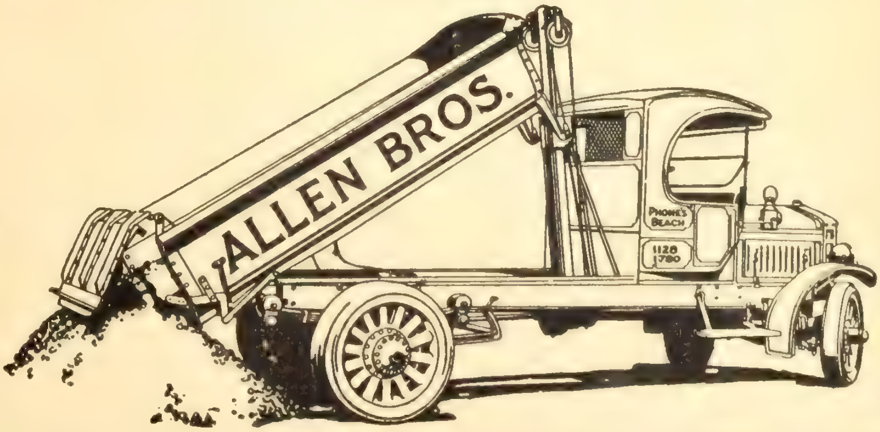

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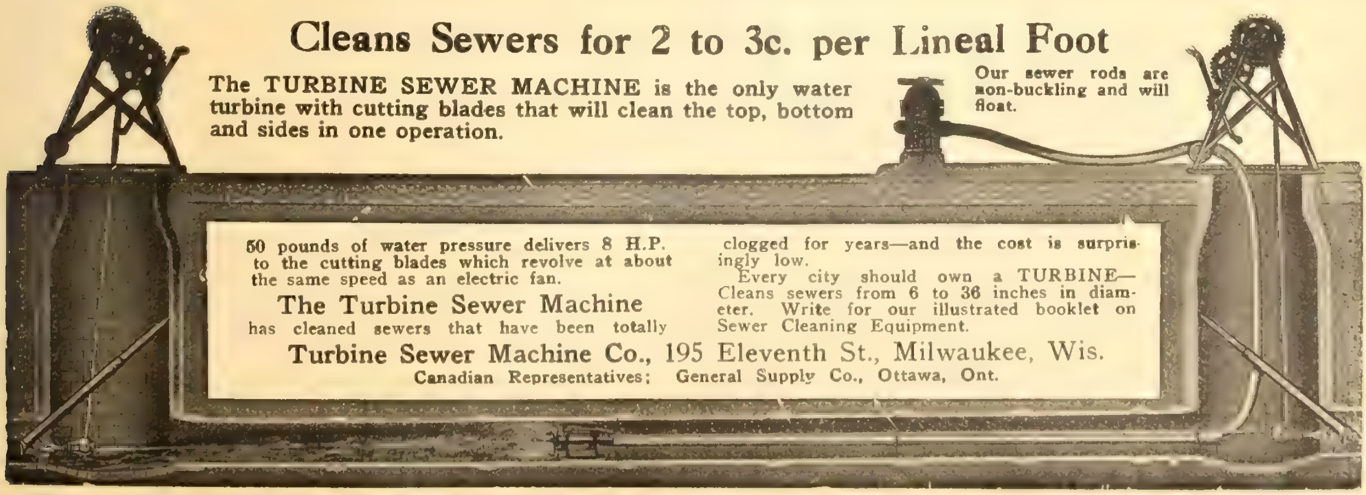

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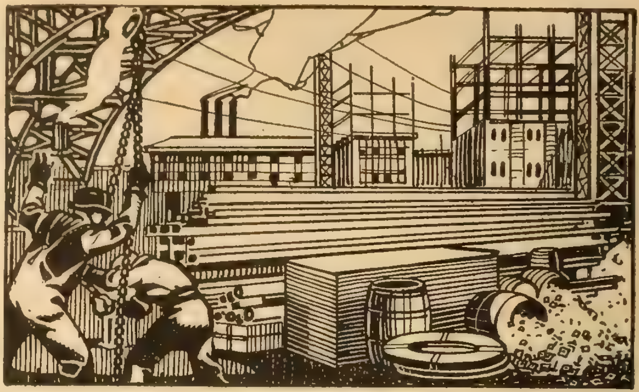

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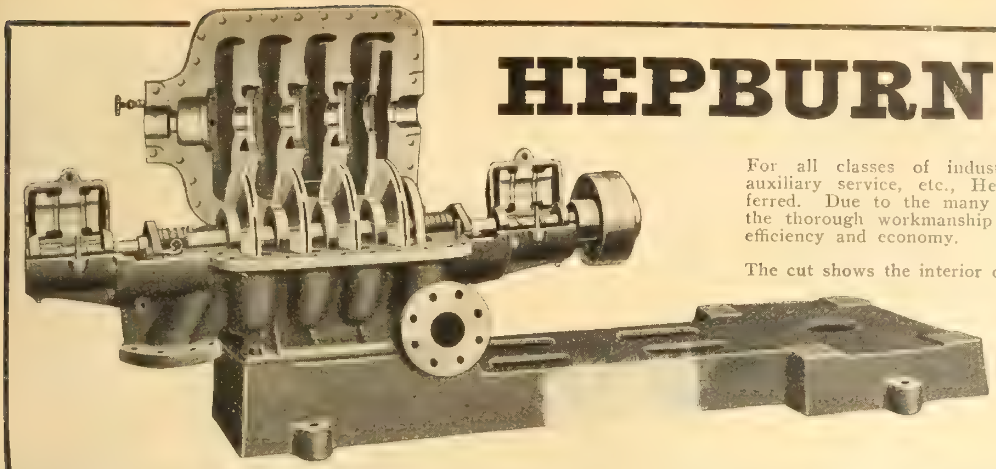

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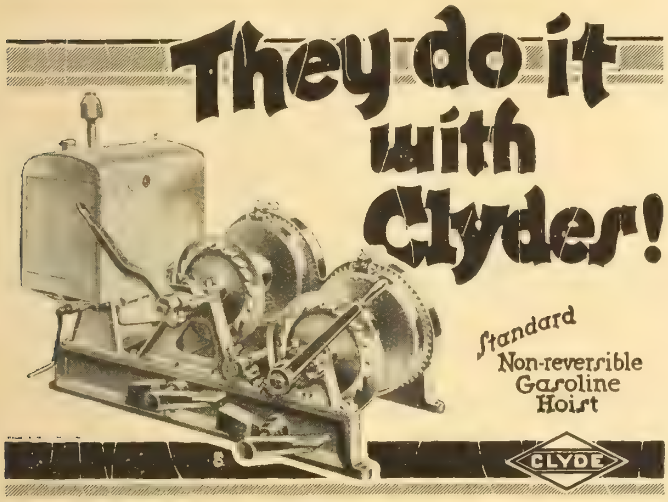

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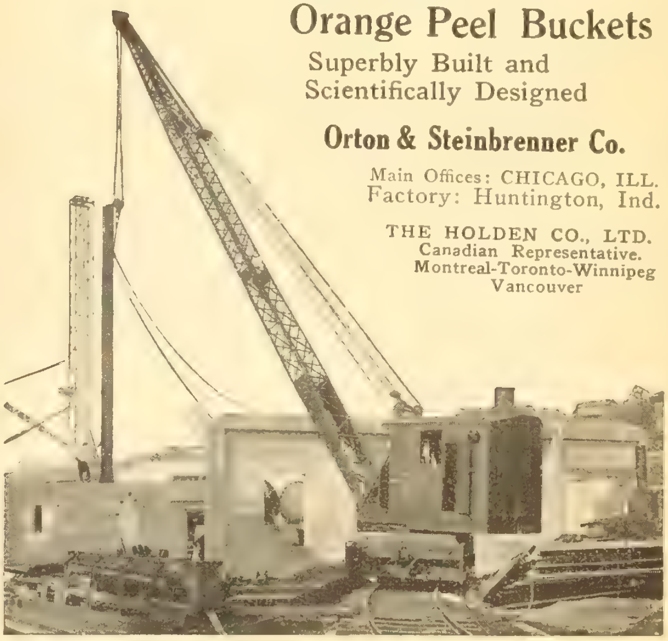

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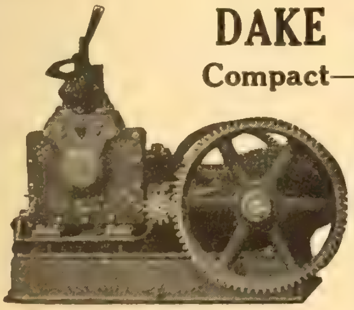

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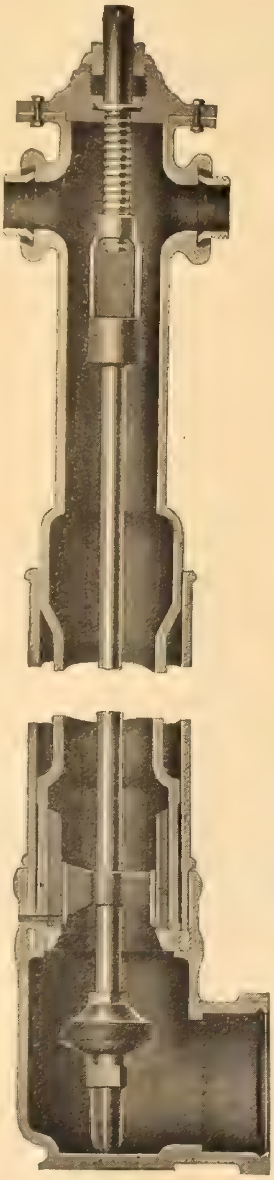

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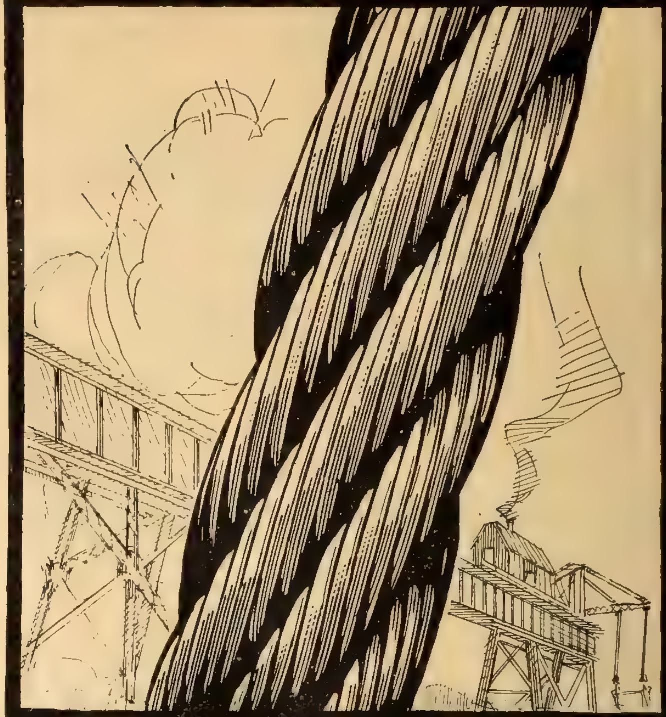

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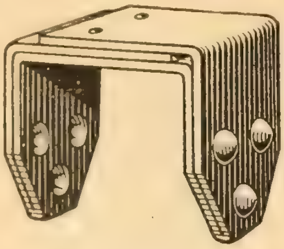

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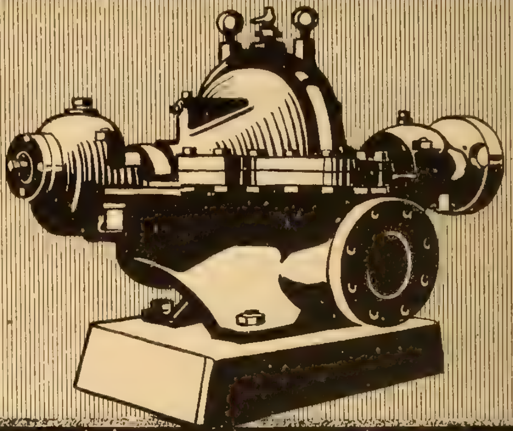

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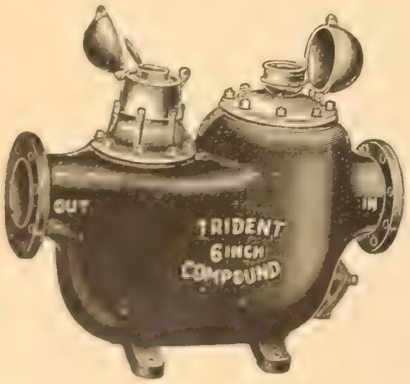

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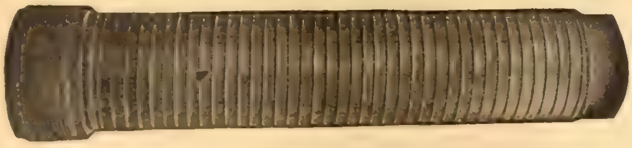

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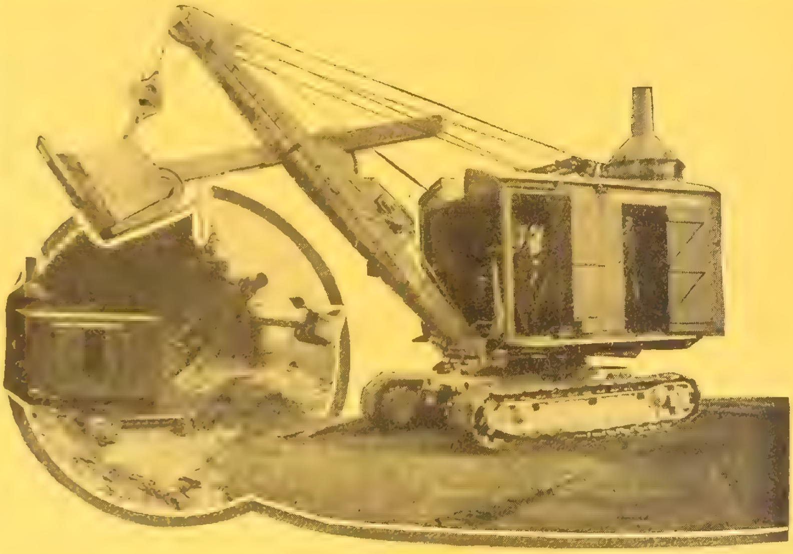

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